This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

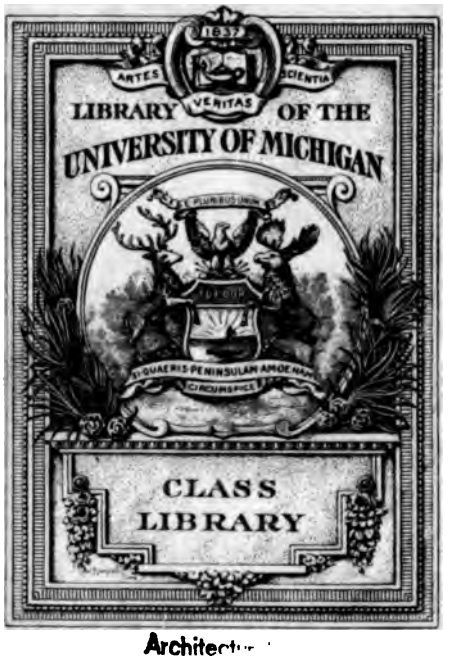
About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

B 914,275

MODERN CITY PLANNING AND MAINTENANCE

FRANK KOESTER



Architecture
Lib

NA
9030
.K78

MODERN CITY PLANNING AND MAINTENANCE

BY FRANK KOESTER

HYDROELECTRIC DEVELOPMENTS AND ENGINEERING, $5.00
MODERN CITY PLANNING AND MAINTENANCE, $6.00
ELECTRICITY FOR THE FARM AND HOME, $1.00
STEAM-ELECTRIC POWER-PLANTS, $5.00
THE PRICE OF INEFFICIENCY, $2.00

MODERN CITY PLANNING AND MAINTENANCE

BY
FRANK KOESTER

CONSULTING CIVIC ENGINEER

AUTHOR OF
STEAM ELECTRIC POWER PLANTS
HYDROELECTRIC DEVELOPMENTS AND ENGINEERING
THE PRICE OF INEFFICIENCY
ETC.

NEW YORK
McBRIDE, NAST AND COMPANY
1914

COPYRIGHT, 1914, BY
MCBRIDE, NAST & CO.

Published, April, 1914

INTRODUCTION

A MOVEMENT of the first importance and of great proportions is taking place among American cities, which while it has not attracted any very marked degree of attention on the part of the general public, is yet one which will have lasting consequences of the most beneficial character.

This movement, the replanning of cities, has only begun to take shape in this country in the last few years, but already great progress has been made, and plans of the most elaborate and magnificent character have been proposed.

The subject is one which is of such importance in the social, æsthetic and practical betterment of cities, that it is of vital interest not only to the city administrator, the engineer and the architect, but also to every citizen who has the advancement of his city's welfare at heart.

One of the reasons which has retarded public interest in city planning lies in the fact that there is to be had very little information on the subject in a form generally available.

While a considerable literature exists in French and German, principally in German, there is but little in English and what there is consists principally of a few books published of late years in England, having in view the object of adapting German practice to English conditions.

The purpose of this volume is to present, in a concise and comprehensive form, the principles of the art of city planning as they have been developed in modern times.

The covering of the subject in such a way in a single volume has not before been attempted, so that nowhere else is to be found the summarization of principles and practice as here presented.

In addition to this statement of principles and practice,

271839

this volume treats of numerous important factors in city planning and maintenance not yet introduced in this country but which have stood the test of time and of practice abroad and which are certain to be adopted here sooner or later as have been many previous improvements.

Among these factors are the zone system for purposes of regulating the height of buildings, block plans and traffic; distinguishing features of cities; a new system communal industry to supplant the trusts; traffic facilities and regulation; harbor equipment for rapid transfer of cargoes, giving inland harbors the advantages of seaboard harbors; minimization of street excavation; new systems of street illumination with high candle power units, both gas and electric; novel and effective methods of police and fire department signalling; electric machinery for street cleaning and fire fighting; combination municipal slaughter-house ice plant systems; utilization of waste exhaust steam for district heating and new methods of raising municipal revenues and dividend payments to citizens instead of tax collections.

There are further treated a large number of novel details involved in city planning, maintenance and administration, which will prove useful in practice wherever introduced as they have been drawn from the experience of other cities both here and abroad and have proven of practical value.

City planning is a subject of many ramifications and covers a much wider field than is generally supposed. It includes not only the æsthetic beautification of the city, but also the construction and co-ordination of all the elements which go to make the modern city a practical operative mechanism.

The planning of a city involves thus the numerous and highly important engineering features which make a city a habitable place and does not merely cover the design and layout of its streets and the more prominent buildings, but goes into every structural element, such as water supply, lighting, maintenance, traffic system, refuse disposal and all the factors which form a part of the completed city. These subjects are here treated in their more general phases only,

since a detailed consideration would be beyond the limits of this volume.

The engineering factors of city planning are of greater importance than the architectural and landscape factors as far as practical conditions are concerned, and the problems and actual work of city planning are greatly of an engineering nature. Operation and maintenance of a city cannot be accomplished in an efficient manner unless there has been engineering at the outset in the city's planning.

An acquaintance with the principles of this art is necessary, not only for a proper understanding of the great movement which is beginning in the United States, but also to enable one to appreciate and to enjoy the work of civic architects and engineers wherever it is found. Indeed, no one who appreciates art in its various forms has fulfilled his duty to himself until he has become familiar with the principles and practice of city planning, and one who has at heart the interest of the city cannot fail to find, in the art of city planning, an inspiration and a means of expression for his best activities. It opens a new vista of civic possibilities and has a direct and important influence on the life of every citizen.

While city planning is a subject of the greatest antiquity and one the principles of which were well understood by the ancients, as is shown by the examples of Greek and Roman towns, and one which in mediæval times was equally well understood, as is proven by such German towns as Rotenburg, Nuremberg, Cologne, Maintz, etc., yet modern city planning, in the sense in which it is now understood, dates from the period immediately subsequent to the Franco-Prussian War, and is of purely German origin.

In 1874, the United Society of German Architects and Engineers laid down certain principles of city planning and gave the first organized impetus to the practice of the art.

Since that time, the principles and practice of modern city planning have spread to other countries and the art has been so rapidly developed that it has now reached a definite

form and its engineering features have been reduced to a science.

Its theory and principles are taught in university courses abroad and it is recognized as a leading and important study. The University of Berlin, for example, devotes a special faculty to the subject.

The author, having had a long familiarity with both the practical and theoretical side of European practice, and during his residence in America the past twelve years, having kept actively in touch with American developments, enjoys an exceptional point of view, and is thus qualified to make his contribution to the subject in the form which now seems to be most needed.

As the problem of every city is an individual problem and must be treated as such, a wide acquaintance and a thorough understanding of the entire field is necessary for the specialist, as otherwise plans may be developed on a scale too primitive and inadequate. Thus a thorough knowledge of the progress made abroad is a necessary part of the specialist's equipment, and the work of city planning should only be entrusted to those who are thus qualified.

It has been the aim to treat, in this volume, the problem of the American city. In doing so, the plans of the various American cities which are considering the subject, some fifty in number, have been examined and the leading features described or shown in illustration. The extent and tendencies of the movement are thus indicated.

The courtesy of the various City Planning and Improvement Associations and Commissioners and Chief Engineers of Public Work of the various cities in supplying material is acknowledged with thanks and appreciation, as is also the similar kindness of a number of foreign cities and of prominent individual authorities abroad, including Professors Felix Genzmer, Joseph Brix, Peter Behrens, Rudolph Eberstadt, Bruno Möhring; Doctor Engineer Joseph Stübben and Chief Engineer Richard Peterson, all of Berlin; Architects Eugen Hénard, Paris, and Max Stirn, Cologne; Professor Hans Poelzig, Breslau, and Professor H. Erlwein, Dresden, and

further, the Deutsche Maschinenfabrik, Duisburg; the Allgemeine Electricitäts Gesellschaft and the Siemens Schuckert Werke of Berlin.

Acknowledgments are also due "The American City" and "The American Architect" in whose columns much of the material of this volume first appeared in the form of articles, including the principal parts of the author's addresses, presented at the congresses for Civic Development, Municipal Administration, and the Progress of Urban Activities, Düsseldorf, Germany, 1912 (Kongress für Städtewesen), and Ghent, Belgium, 1913, (Congrès International et Exposition de L'Art de Construire les Villes et de L'Organisation de la Vie Municipale).

FRANK KOESTER

HUDSON TERMINAL BUILDING,
NEW YORK CITY, MARCH, 1914

AN EARLY APPLICATION OF BASIC PRINCIPLES OF CITY PLANNING IN A SMALL TOWN

The City Hall, Weringerode, Germany (1498 A.D.) on the open square dominates the other structures and is the focal point of the principal streets, while the street at the side, being curved, adds individuality and variety, and the fountain, symbolic of the city's water supply, serves as an embellishment

CONTENTS

		PAGE
INTRODUCTION		v
I	WHAT CITY PLANNING IS	1
II	HOW TO PROCEED IN RE-PLANNING A CITY	11
III	THE CIVIC CENTER *Federal, Municipal, Traffic, Social, Amusement, Educational and Shipping Centers.*	20
IV	THE GREAT GROUND PLAN *Zone or District Systems; Classification and Gradation of Districts; Individuality of Cities; Building Regulations.*	36
V	ARTERIAL HIGHWAYS *Arrangement of Highways; Width of Streets; Cutting New Streets.*	55
VI	STREETS UP-TO-DATE *Appearance of Streets; General Service Tunnel and Pipe Galleries; Street Fixtures; Safety Isles; Sidewalks; Police and Fire Alarm Systems; Shade Trees.*	67
VII	HARBOR IMPROVEMENTS *Harbor Improvements; Terminal Facilities; Water Gates; Canal Transportation.*	87
VIII	BRIDGES AND BRIDGE APPROACHES *Æsthetic Features; Co-operation of Engineer and Architect; Bridge Approaches; Various Types of Bridges.*	98
IX	TRAFFIC AND TRANSPORTATION *Electric Traction; Surface, Elevated and Subway Traffic; Statistics of Rapid Transit; Moving Platforms; Vehicular Traffic; Naming Streets.*	106
X	OPEN SQUARES AND TRAFFIC REGULATIONS *Traffic Distributing Squares; Transportation Terminal Spaces; Forecourts of Public Buildings and Entrance Spaces.*	122
XI	PARK SYSTEMS *Location of Parks; Small, Central and Rural Parks; Floral Parks and Gardens. Communal Ownership Parks; Athletic and Play Grounds.*	139
XII	CIVIC EMBELLISHMENT *Boulevards; Plazas; Parks; Terraces; Monuments; Fountains; Gates; Arches; Shade Trees; Bridges; Comfort Stations; Bay Fronts; Water Gates; Quays.*	149

PAGE

XIII BUILDING REGULATIONS AND BLOCK PLANS 166
Height of Buildings; Arrangement of Buildings; Proportion of Lot Built Upon; Gradation of Factories; Size of Apartments; Workingmen's Houses; Block Plans.

XIV GARDEN CITIES 183
Principles of Garden Cities; Workingmen's Colonies; Social Facilities; Surburban Gardening.

XV CIVIC CULTURE 201
Schools; Churches; Theatres; Museums; Art Galleries; Libraries; Concert Halls.

XVI ADMINISTRATIVE FUNCTIONS 206
Hospitals; Poorhouses; Lodging Houses and Rescue Homes; Orphan Asylums; Homes for Widows and the Aged and Infirm; Police and Fire Departments.

XVII COMMUNAL INDUSTRIES 217
Municipal Markets; Co-operative Markets; Municipal Slaughter Houses and Ice Plants; Public Baths; Stimulation of the Co-operation of Small Manufacturers; Central Manufacturing Plants for Co-operative Industries.

XVIII CITY CONSTRUCTION AND MAINTENANCE 230
(*A*) STREET CONSTRUCTION 230
Street Paving; Street Repairing; Municipal Paving Plants; Double-Decked Streets; Pipe Galleries.

(*B*) SEWERS 241
Systems of Sewers; Sewage Disposal Plants.

(*C*) CARE OF STREETS 245
How to Preserve Street Surfaces; Street Sanding; Street Flushing.

(*D*) STREET CLEANING 248
Hours for Street Cleaning; Methods of Street Cleaning; Garbage and Snow Removal.

(*E*) REFUSE DISPOSAL 254
Land and Water Dumping; Incineration of Refuse; By-Products of Garbage and Refuse.

(*F*) WATER SUPPLY 258
Purification Systems; Water Works; Water Distribution; Water Consumption.

(*G*) GAS SUPPLY 266
Coal Gas; Water Gas; By-Products; Gas Pressure; Gas Distribution.

(*H*) ELECTRIC GENERATING PLANTS 269
Steam- and Hydro-Electric Plants; Internal Combustion Engine and Combination Plants; Size of Machinery; Electric Current Distribution; Central Station Service.

(*I*) ELECTRIC STREET RAILWAYS 275
Systems of Railways; Sub-Stations; Car Barns; Railway Equipment and Operation.

XIX VALUATION OF PUBLIC UTILITIES 281
Basis for Valuation; Physical Factors; Equitable Adjustment; Confiscatory Valuation; Valuation in City Planning.

PAGE

XX FINANCING CIVIC IMPROVEMENTS 287
Distribution of Costs; Excess Condemnation; Apportionment of Assessments; Commission of Assessment and Condemnation.

XXI THE PLANNING OF GROWING TOWNS 294
Planning Towns at the Outset; Cost of Town Planning; Necessity of Expert Knowledge; Principal Factors in Town Planning; Town Sites; Civic Improvement Associations.

APPENDIX

"CO-OPERATION OF ENGINEER AND ARCHITECT IN CITY PLANNING" 305
Author's Address delivered at the International Congress and Exposition for City Planning and City Maintenance, at Ghent, Belgium, 1913.

THE EXECUTIVE MANAGEMENT OF A CITY 318

INDEX 323

MODERN CITY PLANNING

City planning determines the destiny of a city.

It develops artistic taste, civic pride and patriotism; it makes better citizens and artisans; it adds to health, comfort and happiness; it helps to increase the population and to produce industrial prosperity.

City planning attracts industries, commerce and visitors; it produces better transportation facilities, improved hygienic conditions, and more adequate and less expensive living quarters and food supplies.

City planning is a business proposition of the first importance.

THE ILLUSTRATIONS

City Hall Square, Wernigerode . . . . . *Frontispiece*
Forum, Pompeii . . . . . *Facing Page* 4
Street of the Tombs, Pompeii 4
Markus Tower, Rothenburg 5
Gate of Victory, Munich 12
Porta Nigra, Trier (Tréves) 12
Woolworth Building, New York 13
Justitz Palace, Munich 20
City Hall and Courts, St. Louis 20
Konigsberg, Square 21
Civic Center, Seattle 28
Civic Center, Ground Plan, Seattle 29
Zwinger, Dresden 34
Burgplatz, Vienna 34
City Hall, Munich 35
Place du Chatelet, Paris 40
Rue de Rivoli, Paris 41
St. Michel Fountain, Paris 46
Flatiron Building, New York 46
Comfort Station, Providence 47
City Hall Plaza, Philadelphia 52
Watergate, Chicago 52
Princes Street, Edinburgh 53
Trafalgar Square, London 58
Market Plaza, Wiesbaden 59
Tauentzien Street, Berlin 68
Charles Gate, Munich 68
Gaiety Theater, London 69
St. Peter's, Rome 69
Double Arm Lamp Post 72
Double Arm Trolley Post 72
Single Arm Lamp Post 72
Newspaper Stand 73
Advertising Column 73
Municipal Clock 73
Friederich's Museum, Berlin 78
Central Park, New York, Illuminated 79
Public Library, New York, Illuminated 79
Twenty-Third Street, New York 84
Street Widening, New York 84
Barbarossa Plaza, Cologne 85
Maximilian Street, Munich 85
Harbor, Neuss 88
Harbor, Frankfort 88
Harbor, Hamburg 89
Harbor, Bremen 89
Docks, Hamburg 92
Chelsea Docks, New York 92

Air Ship Harbor, Potsdam 93
Water Front, Kiel 96
Jungfernstieg, Hamburg 96
Thames Embankment, London 97
Rhine Bridge, Bonn 100
Rhine Bridge, Cologne 100
Alexander Bridge, Paris 101
Spree Bridge, Berlin 101
Union R. R Station, Washington 106
Grand Central Station, New York 106
Pennsylvania Station, New York 106
Railway Station, Cologne 107
Railway Station, Frankfort 107
Elevated Railway Station, Berlin 114
Elevated Railway, Berlin 114
Bülow Street Station, Berlin 115
Nollendorf Plaza Station, Berlin 120
Subway Kiosk, Buda-Pest 120
Votiv Church, Vienna 121
Augustus Square, Leipzig 126
Plaza del Popolo, Rome 126
Friederich's Plaza, Frankfort 127
Franzens Ring, Vienna 127
Brandenburger Gate, Berlin 134
Avenue of Victory Berlin 134
Terrace, Sanssouci, Potsdam 135
Wilhelma, Canstadt 135
Palm Garden, Frankfort 140
Concert Salon, Gotenburg 140
Court Garden and Allee, Düsseldorf 141
Assembly Center Philadelphia 146
Wilhelmina Sea Bridge, Scheveningen 147
Piazzetta, Venice 152
Harbor Gate, Lindau 152
Monument Light Columns, Berlin 153
River Promenade, Düsseldorf 153
Rothenburg, Herrengasse 158
Monument, Berlin, Illuminated 159
Unter Den Linden, Berlin, Illuminated 159
Bismark Monument, Hamburg 160
Bismark Monument, Berlin 160
Völkerschlacht Monument, Leipzig 161
Hermannsschlacht Monument 161
Skyline, Cologne 168
Skyline, Bremen 168
Skyline, Hamburg 168
Munich, General View 169
Workingmen's Apartment Houses 174
Court of Workingmen's Houses 174
Residential Street, Berlin 175
Architecture of Large Manufacturing Buildings 178
Architecture of Large Drygood Store Buildings 179
Court of Workingmen's Houses 188

Building for the Aged 188
Workingmen's Colony, Altendorf 189
City Theater, Frankfort 204
Opera House, Frankfort 204
Cathedral, Cologne 205
Gate to Greenwood Cemetery, Brooklyn 212
Gate to Cypress Hill Cemetery, Brooklyn 212
National Maine Monument, New York 213
Children's School Gardens, Lock Haven 220
Swimming Pool, St. Louis 220
Fairy Fountain, Friederichsheim 221
Municipal Abattoir, Dresden 228
Bush Terminal, Brooklyn 229
Terrace, Central Park, New York 234
Gateway, Sanssouci, Potsdam 235
Sicilian Garden, Sanssouci, Potsdam 235
Sunken Refuse Receptacle 248
Refuse Can for Street Sweepings 248
Refuse Collecting Cart 248
Refuse Destruction Plant, Hamburg 249
Sewage Disposal Plant, Philadelphia 249
Waterworks, Peking 258
Waterworks, Leutzsch 259
Fountain Paolina, Rome 264
Fountain Trevi, Rome 264
Wittelsbach Fountain, Munich 265
Gas Works, Frankfort 274
Electric Generating Plant, Dresden 274
Water Tower, Stellingen 275
Water Works, Posen 275
Schloss Plaza, Berlin 282
Burg Theater, Vienna 282
Castle Square, Karlsruhe 283
Hall of Liberty, Regensburg 288
Bavaria, Statue, Munich 288
Emperor Welhelm I. Monument, Bonn 289
Kyffhäuser Monument, Harz Mountains 289
Naples, Italy 294
Workingmen's Colony, Alfredshof 294
Limburg-Lahn Valley 295
Coburg with the Veste 295
Harbor at Antwerp 306
Lift-Bridge, Duisburg-Ruhrort 306
Landwehr Canal, Berlin 307
Subway Station, City Park, Berlin 312
Bridge, James Park, Madison, N. J. 313
Bridge, Golden Gate Park, San Francisco 313
Interior of Elevated Railway Station, Berlin 316
Interior of Subway Station, Berlin 316
Tivoli Hydro-Electric Plant, Rome 317
Grand Staircase to Statue of St. Gellért, Buda-Pest 320
Garden Staircase, Buda-Pest 320
Fountain of Neptune, Firenze 321

DRAWINGS AND DIAGRAMS

	PAGE
Forum, Rome, Plan	22
Forum, Pompeii, Plan	27
Civic Center, Hirschberg, Plan	33
Civic Center, Hirschberg, View	33
Cologne, Ground Plan	37
Mannheim, Great Ground Plan	39
Karlsruhe, Great Ground Plan	41
Washington, Great Ground Plan	43
Radial and Circumferential Streets	48
Delhi, India's Capital	50
Carberra, Australia's Capital	52
Waterways, Chicago	52
Street Profiles, Berlin	56
Street Profiles, Berlin	57
Cologne, Re-planning Streets	61
Approaches to Railroad Terminal, Berlin	63
Chicago, Great Ground Plan	65
Safety Isles	71
Harbor, Frankfort	95
Suspension Bridge, Berlin	101
Stone Arch Bridge, Berlin	101
Steel Arch Bridge, Berlin	101
Density of Population, Paris	108
Volume of Traffic, Paris	109
Volume of Traffic, Berlin	112
Rotherhithe Tunnel, London	118
Congested Street Traffic	124
Underground Street Crossings	125
Super-Imposed Street Crossing	128
Traffic Regulation, Columbus Circle, New York	130
Traffic Street Signs	132
Parks and Boulevards, Kansas City	137
Parks and Boulevards, Boston	144
Parks and Boulevards, Berlin	145
Gateway, Berlin, Proposed	151
Kings Plaza, Berlin	157
Diagram, Determining Width of Streets	167
Diagram, Balancing Low Buildings	167
Tall Buildings	171
Blocks for Garden Cities	176
Typical Open Block Plans	181
Liverpool Garden Suburb	184
Workingmen's Colony, Dahlhauser Heide	190
Garden City, Port Sunlight	193
English Workingmen's Home	196
Oscar Plaza, Berlin	202
Vendôme Plaza, Paris	203
Plan of the Cathedral, Ulm	204
Double Deck Business Street	237

PAGE
Double Deck Residential Street 239
General Public Utility Tunnel 241
Sub-Surface Draining of Streets 246
Draining Street Railway Rails 247
Metropolitan Subway, Paris 276
Elevated Railway, Berlin 277
Suspended Railway 279
Assessment of Seventh Avenue, New York 291
Tempelhofer-Feld 296
Two Ground Plans of City's Extensions 298
Suburban Colony, Ahrensfelde, Berlin 301

MODERN CITY PLANNING AND MAINTENANCE

CHAPTER I

WHAT CITY PLANNING IS

ONE of the most significant movements in the history of American cities is now beginning to manifest itself. It is the development of the science of city planning, so long neglected, with such costly results as are seen in the unnecessary congestion and crowded conditions of some portions of cities and in the backward development of other portions; in the slums on the one hand and the inaccessible suburbs on the other, so characteristic of the majority of American and English cities.

City planning is not only a question of engineering and architecture; it goes more deeply into the lives of the citizens, affecting them in numerous ways with a degree of importance that can only be realized by those who have made a special study of the subject.

The effect on its citizens of the building of a city in accordance with the highest principles of the art of city planning will be one of a remarkable betterment in their social, ethical and physical conditions. The superior appearance, beauty and harmony of the city will develop artistic taste and will result in increased civic pride and patriotism. This in turn affects the character of the individual favorably, improving moral conditions. The better hygienic system of the well-planned city provides more light, purer air and more healthful and less expensive living quarters, affecting the whole lives of the citizens favorably.

The improved plan of the city by providing safer and more direct means of transportation prevents accidents and saves enormous amounts of time. The conveniently located

parks, recreation places, public baths, gymnasiums, with ready access to woodlands and athletic fields, provides increased opportunity for physical development. The proper location of municipal markets affords cheap and wholesome supplies of food. These factors, with convenient location of schools, libraries, churches and other structures of a public nature, all unite to place the life of the citizen on a higher plane. A greater sense of responsibility is instilled while the comfort and enjoyment of the individual is added to, and an increase of population of a higher character effected.

While the movement in its present recrudescence is very recent, the art of city planning is one of the greatest antiquity. The remains of the earliest communal abodes of man, of however primitive a nature, show a certain definite arrangement. With the development of races, villages became towns and towns cities, continually on a larger scale, and it is undoubtedly true that the higher the degree of civilization of a people, the greater will be the size of its cities. The civilization of the Romans was largely expressed in the city of Rome, and the glories of ancient peoples generally were shown in their cities.

In the art of city planning, genius has occasionally arisen, among the early masters being Merian and Canaletto, the former developing the general plan of the city, and the latter excelling in its interior arrangements. Sir Christopher Wren in 1666, after the great fire of London, had the genius to reconstruct the city on a plan that would have made it one of the most beautiful in the world, but he was ahead of his time and London was permitted to grow up into the disordered mass of streets and lanes that make it the greatest spot of confusion to-day on the face of the globe.

L'Enfant, however, who planned the city of Washington, admittedly the most beautiful city in America and one of the most beautiful in the world, enjoyed the double good fortune of having the support of the founders of the republic and an unencumbered site upon which to build, while most city planners have had to reorganize existing cities.

Equally fortunate was Baron Haussmann who rebuilt Paris. He was given a free hand and a plan was developed, in which conceptions of order, convenience, variety and grandeur were not allowed to be interfered with by question of expense. Great avenues were cut through labyrinths of streets, and foul and congested districts were replaced with parks and spacious squares. Hundreds of millions were spent and Paris is still spending gladly and with a lavish hand for extensions of his plan.

The early masters, however, did not impart their theory, leaving only their accomplished work as examples. Modern or practical city planning, therefore, is a new art, based upon principles, theories and practice only recently placed on a scientific basis. The modern masters are Reinhard Baumeister, the pioneer of the science of modern city planning, and Camillo Sitte, the formulator of its æsthetic principles, while Joseph Stübben is the greatest of practical city builders. Their work is available in theory, design and practice and will serve for future emulation as it has served modern Germany so well, as the basis of her wonderful cities.

In the scope of practical city planning are included the broadest principles and the fullest details. The leading elements are the plan of the city as a whole, the segregation in suitable districts of the different classes of the population, and their proper housing in classes of structures suited to their requirements, the arrangement of such classes of structures in groups and district units, and the placing of such groups and units in proper relation to the whole; the development of other classes of units, such as civic centers, parks, public squares, grounds, athletic and recreation fields and cemeteries, and their location with reference to their uses and nature; the supplying of the units with the facilities and the public structures necessary for the business to be transacted in them; the location in civic centers of buildings suited thereto, both as to their uses and their architectural characteristics; the arrangement of systems of transportation, the laying out of streams of traffic, location of railway stations and bridges and harbor facilities; the systematic

location of schools, libraries, churches, hospitals, institutions, theatres and other semi-public structures; the general hygienic design of buildings and the system of city sanitation and waste disposal; the laying out of adjoining lands, woods and fields for purposes of recreation, the artistic regulation of structures and street plans and the laying out of surrounding territory, all in accordance with a settled plan, adapted to fulfill in the best possible way the purposes intended and to take care of the growth of the city and prevent its abnormal development.

The planning of a city, like the planning of anything else, should be carried out with a view to the use which is to be made of it, and to adapt it best to that use, and in addition to make it as pleasing from an artistic point of view as possible. There should first be strength in the design and, if strength be economically manifested, the artistic enrichment of the design will be easily effected.

In city building, the strength of its design may be indicated by its plan. Its streets and avenues should be broadly and firmly laid out, advantage taken of its natural site and a sense of unity caused to pervade the whole as a result of its unity in structure. Its design should not be crowded, or its streets narrow and haphazard, nor should they be throughout of such absolute uniformity as to destroy their individuality, and make the city merely a monotonous aggregation of streets, as is so often the case in American cities.

A city should be planned and built with breadth of view and boldness of execution; it should be built for the future more than for the present, and its design should halt at no necessary elaboration nor consider expense.

What the city is for should always be considered and the most economical and effective methods of reaching its aims should be adopted, yet the fact that it is not merely utilitarian should not be lost sight of. A city should not only be a place of residence but an inspiration to its inhabitants and a worthy object of their civic pride.

The city has a powerful psychological effect upon its inhabitants, and a beautiful city is not only a pleasure to the

THE FORUM, POMPEII

STREET OF THE TOMBS, POMPEII

Examples of classic city planning

ROTHENBURG ON THE TAÜBER, MARKUS TOWER AND RODER ARCH

A picturesque spot in the most picturesque of the old cities of Germany. ***Much studied by modern city planners for secrets of charm and individuality***

æsthetic sense, but a stimulus to right conduct. Mean deeds are most apt to be enacted in mean streets, and the plunderer avoids the stately square and broad avenue. A murderer seldom if ever seeks his victim on the steps of a capitol or in the corridors of a library or gallery.

The basis of the design of the city is found in the purposes for which it is constructed, and these include:

The housing of its inhabitants and their industries;

The conveyance of supplies and materials of manufacture and manufactured products;

The disposition of waste materials;

The arrangement of the city in an accessible manner, with rapid and convenient means of transportation;

The provision of facilities for education, assistance and recreation for the common use.

These are the fundamental objects of the city, and cities exist because these objects can be more effectively attained when large numbers of people live in close proximity than when they are separated, for otherwise cities would never come into existence and the population would remain scattered on small farms.

City building is, to a very great extent, an engineering undertaking. The architect and the landscape architect cooperate with the civil engineer, the electrical engineer, the mechanical and sanitary engineer in the construction of the city. Their work includes street construction, electric traction, surface, elevated and subway; city lighting, bridges, quays, docks, piers, harbors, and waterways, railway terminals, central light and power plants, electric current distribution, gas and central heating plants, aqueducts and water filtration and distribution, sewage systems and garbage collection and disposal, slaughter houses and market places, public baths and recreation places and piers, heating, lighting and ventilation of public and private buildings, telephone, telegraph, police and fire-alarm systems and numerous similar problems.

The work of the engineer not only includes the building of the city, but extends largely into many of its operations,

such as the handling of freight and traffic both on land and water, the operation of electric transportation systems, surface, elevated and subway; electric lighting, power, heating, and gas plants, water works, sewage and refuse disposal, street construction, and the operation of many of the engineering works which they are first called upon to construct.

Thus the numerous and important problems of the city are calling forth a new and specialized form of engineering in America. It is customary to include the detail engineering work of the city in the province, for the most part, of the civil engineer, who for such purposes is often called the municipal engineer. The field of engineering in the building and rebuilding of cities, however, is of a much more comprehensive and fundamental character, and deserves a special designation, such, for example, as city or civic engineering. A special course of training for the civic engineer should be offered by universities and the civic engineer should make a thorough study of all the problems of the city.

No greater field of usefulness is open to the engineer and the subject is one that demands the most exhaustive study. At the present time, a great awakening is taking place in the United States on the subject of city planning. The great benefits to be derived are beginning to be appreciated and civic pride is taking form in American cities. But at the same time many blunders are being made and great waste incurred by ill-advised plans of improvement. A commission of prominent citizens is usually appointed, when the subject is taken up, and after a trip to Europe, they return with recommendations, which after being modified to allow a rich harvest of graft on the part of politicians, are finally put into effect with results such as could have been expected.

Civic engineering, however, is not a subject to be so readily mastered. Its theory and practice require long and thorough study and experience, and a wide acquaintance with all that has been done abroad, particularly during the last thirty or forty years. The hasty remodelling of a city

by a commission having only a superficial knowledge of the subject is liable to result in far more harm than good.

To secure the best results in city planning, a competent civic engineer should be placed in charge of the work and be given sufficient time to make a thorough study of the city and its needs from an expert and entirely disinterested point of view. He should, free from influences, evolve plans which will meet its requirements and enable it to develop along the best lines. This work, to be properly performed, must be done by an expert, and by one who has no personal interest whatever in the city. No commission of citizens can approach the matter without being swayed either by self-interest, personal considerations or prejudice, and certainly few such commissions could be selected to contain civic engineers of approved qualifications.

Although politicians come in usually for nothing but condemnation, which is too often richly deserved, there is no good reason why, if graft must exist, it should not accomplish its purpose in an artistic manner. If selfish interests dictate a city's government, they certainly can find it just as lucrative to remodel the city on the right lines as on the wrong lines, thereby greatly increasing its prosperity and their own subsequent opportunities for activity.

City planning, however, should not be and need not be a matter of politics. In Germany, any intrusion of politics in such a matter would be ridiculous, yet clever politicians can improve a city as lavishly, if not more so, and to better effect, than a misguided body of citizens after a cursory attention to the subject on a junket.

In selecting a civic engineer, the city should by no means restrict itself to engineers residing in the city itself, for it is seldom that competent engineers can be obtained if this restriction is imposed. The city should endeavor to obtain the best and most competent civic engineer available, whether resident or not, and no hesitation should be had in going to other cities or even abroad to get the right engineer. Indeed the demand for competent men is so great that they command high compensation, which, however, is trivial in

comparison with the work to be accomplished. While any local engineer or architect will tackle the job of replanning the city, no greater mistake can be made than to place the work in such hands.

The example of Washington should be followed, if necessary, the Continental Government not being misguided by false patriotism, but sending abroad for the French engineer L'Enfant. A number of conspicuous failures in city replanning are already to be seen in the United States, where the work has been in charge of architects not competent to handle the problems.

Every city, too, should have on file a comprehensive plan for its ultimate improvement. Practically all buildings become obsolete in thirty or forty years. With the ultimate city plan laid out, permits for new buildings would not be allowed which would interfere with the ultimate plan. Thus, in an automatic manner, the city would gradually shed its old structures, and presently appear in its permanent plan, with a minimum of expense and inconvenience. In addition, as many cities will undoubtedly be visited by great fires in the future, as in the past, every city should have on hand such a plan, so that in the event of a fire, the rebuilding of the burnt area could be immediately undertaken in accordance with the comprehensive, ultimate plan already evolved, instead of allowing the old sections to be rebuilt in the old way and with the old mistakes.

Practical city planning is not only not necessarily a source of expense to the city, but is frequently a means of profit, conferring its benefits not only on the citizens directly, but often relieving them of a large part of the burdens of taxation.

More important, however, is the great civic stimulus effected. The extent to which this goes is far more than is realized by the average observer. In Germany, where city planning has reached its highest development, the results are most remarkable. This is shown by a comparison of six cities in Germany, selected at random, with six cities in the United States, which had in 1880, approximately the same population.

Cincinnati has grown 16.1 per cent, 27.7 per cent and 42.8 per cent respectively in the three decades, while Breslau's growth has been 22.8 per cent, 54.9 per cent and 87 per cent during the same time. In the thirty years Buffalo has increased 173.4 and Cologne 254.6 per cent; New Orleans, 56.9 per cent and Dresden 147.1 per cent; Louisville 80.9 per cent and Hanover 146.2 per cent; Providence 113.9 per cent and Nuremberg 234.1 per cent, and Rochester 144.1 per cent and Chemnitz 237.1 per cent.

The German cities have increased almost twice as rapidly as the American cities, and while all this increase is not due to city planning, a very considerable portion of it may be so ascribed.

Mr. Frederic C. Howe, the eminent writer, in "City Building in Germany" in *Scribner's Magazine* of May, 1910, states:

"I know of no cities in the modern world which compare with those which have arisen in Germany during the past twenty years. There are none in Great Britain, from which country official delegations are constantly crossing the North Sea to study the achievements of the German city. There are none in France, in which country the building of cities has made but little progress since the achievements of Baron Haussmann made Paris the beautiful city that it is.

"Important as is the honesty and efficiency of the German city, it is the bigness of vision, boldness of execution and far-sighted outlook on the future that are most amazing. The German cities are thinking of to-morrow as well as of to-day, of the generations to follow as well as the generation that is now upon the stage. Germany alone sees the city as the center of the civilization of the future, and Germany alone is building her cities so as to make them contribute to the happiness, health and well-being of the people. This seems to be the primary consideration. And it is unique in the modern world.

"Far-sightedness characterizes Germany in all things. Alone among the nations of the earth, Germany is treating the new behemoth of civilization as a creature to be controlled,

and made to serve rather than to impair or destroy humanity.

"The German city is being built on a scale of generosity which halts at no expense. Its public school buildings rival in splendor the best modern buildings of our great universities. And the equipment is of the same order. I know of no public schools, even in New York and Boston, that seem as costly in their construction or more complete in every detail as those of half a dozen German cities.

"The motive of all this beauty, harmony, business enterprise and foresight is so obvious to the German that he cannot comprehend why it should be questioned. "Why does a merchant erect a fine store-room or build himself a mansion?" he asks. The German city thinks as an individual thinks about his business and his home. A finished city attracts people. It brings manufacturers and business. People choose a beautiful city as a place of residence. Visitors make pilgrimages to it. Well-educated children make better citizens, better artisans. The street railways, gas works, docks and other enterprises pay their way. They even make money. But more than this, they are a necessary part of the city and of course they should be owned by it. If it be suggested that all this is socialistic, the German business man shrugs his shoulders and says: 'It may be, but it is good business.' It is much better than good business, it is good statesmanship."

The arrangement of traffic and canal systems, location of factories, the easy movement of products, the well-nourished condition and the ambition of employees, furnish a powerful impetus to industry. City planning justifies itself at every point, and America is waking up to it in a wonderful way.

There are already some 100 cities adopting more or less comprehensive plans of city planning, and the number is constantly being increased.

CHAPTER II

HOW TO PROCEED IN RE-PLANNING A CITY

To participate in the re-planning of a city is a civic duty of the highest character. As in no other way can a city be so greatly benefited, those who take part in such movements serve not only their own interests, but the interests of the whole public.

The importance of city planning is so great, that once it is understood, it meets with unqualified public approval, and the strongest forces in a community are always in its favor. It is a movement, which as it proceeds, encounters less and less opposition, being at once a credit to the city and to its originators. It may well become an avocation of the greatest interest and absorption, and is one of the first importance, not only to the citizen but to the community.

Often a single public-spirited citizen with very little expenditure of effort can initiate such a movement. At an informal dinner the subject may be brought up and the first steps taken, that is, to interest a few men of prominence in the idea. A committee may then be judiciously selected, of those who are willing to lend the weight of their names to the undertaking, while the active interest is still manifested by the originators.

A permanent organization of some size is then formed, which may be known as a Civic Improvement or City Planning Association. It should be representative of the most prominent members of the different professions and should include in its membership leading business men, bankers, lawyers, editors, architects, engineers, painters, sculptors, educators, clergymen, representatives of various public welfare societies, the mayor of the city, commissioners of public works, and leading representatives of outlying communities.

The newspapers will, of course, have been interested in the movement from the outset.

The first step is to raise a fund for purposes of securing plans and meeting the expenses of the movement, and this may be accomplished either by an appropriation made by the municipal authorities, by donation from a philanthropist or by a general public subscription. It is advisable to have as great a general interest as possible created in the subject, as it will thus receive a degree of support which would not be accorded it were its activities confined to a limited number.

One of the best means of arousing public interest in city planning is the giving of public lectures on the subject by experts. Such a lecturer should always be obtained whatever the plan followed, and the lecture should be accompanied by illustrations of what has been done and is contemplated in other cities. It is possible, even, in some cases, to obtain moving pictures of cities noted for their design, such, for example, as the moving pictures of Washington. These give considerable added interest to the lectures, without involving much additional expense.

A preliminary fund of from two to fifty thousand dollars, according to the size of the city, should be raised. A fund of fifty thousand dollars might profitably be expended as follows:

Fee of expert	$15,000
Surveying, engineering, estimates and office and field expenses	20,000
Rent, stationery, salaries, etc.	7,000
Printing reports	3,000
Exhibition of plans	3,000
Meetings	2,000

The work of the expert is to supervise the whole undertaking, to conceive the design and develop the plan; to direct the work of the engineering staff and that of the office as well. He is the directing head of the whole undertaking, and working in harmony with the commission, should have a free hand to develop the best possible plan. In cases where more than one solution of the problem of the city's

GATE OF VICTORY, MUNICH

Erected to the Bavarian Army and modelled after the Triumphal Arch of Constantine at Rome

PORTA NIGRA, TRIER (TRÈVES), GERMANY

Well preserved city gate of the Romans, dating from the second half of the third century, A.D.

WOOLWORTH BUILDING (750 FEET HIGH)
Seen from archway of Municipal Building, New York

re-planning is practicable, he should submit tentative plans for the further consideration of the commission and the public.

The engineering cost includes estimates of the cost of re-planning, of the cost of civic centers, buildings, condemnation proceedings, new street plans and estimates of the probable cost of the entire work, in pursuance of the different schemes submitted.

When the work of the expert has been completed, a public exhibition should be held of the drawings and plans, and they should be subjected to the criticism of the public at large and discussed in public meetings and in the press.

The commission should then decide upon the plan to be adopted, and the work then should be actually undertaken.

If the original appropriation is made by the city, the commission would at that time have been made a legal body and part of the city government, but if the original fund is raised in another manner, it is unnecessary for the commission to become a legal body until the city actually undertakes the work, when a smaller board may be formed having the necessary legal powers to carry on the work, the original commission still existing as an informal body for sustaining public interest and advancing the cause.

A good example of how such a body may be given legal power is to be seen in the city charter of Seattle, Wash. It is as follows:

ARTICLE XXV

"SECTION 1. That there be and hereby is created a commission to be known as a Municipal Plans Commission, which shall consist of twenty-one members. It shall be the duty of said commission to procure plans for the arrangement of the city with a view to such expansion as may meet probable future demands. These plans shall take into consideration the extension of the City and City works into adjacent territory; improvement and changes in public utilities and lines of transportation by surface, underground

and water; the location, widths and grades of arterial highways necessary for the best treatment of the city; the development of the water front with its sea wall and wharves; the location of public buildings and municipal decorations; and such further extensions of and additions to the park and boulevard systems of the City as it may, in conjunction with the Park Board, find advisable.

"SECTION 2. The members of such commission shall be citizens of the City of Seattle and shall be chosen in the following manner, to-wit: Three shall be elected from the City Council by its members; one shall be elected from the Board of Public Works by its members; in the same way one member shall be elected from the King County Commissioners; one from the Seattle Board of Education and one from the Seattle Park Commission. The other members shall be appointed by the Mayor in the following manner, to wit: Each organization hereinafter named shall nominate two of its members and the Mayor shall appoint one of the two so nominated. The interests representing the water front owners, steam railway companies, street railway companies and marine transportation companies shall organize, respectively, by mass meetings, at which a chairman and secretary shall be elected, and such officials shall certify to the Mayor the two names elected at such meetings. The call for such meetings shall be given publicity in the press of the city.

"The Pacific Northwest Society of Civil Engineers.

"The Washington State Chapter of American Institute of Architects.

"The Seattle Chamber of Commerce.

"The Seattle Commercial Club.

"The Manufacturers' Association.

"The Central Labor Council.

"The Seattle Clearing House Association.

"The Seattle Bar Association.

"The Seattle Real Estate Association.

"The Carpenters' Union.

"The Water Front Owners.

"The Steam Railway Companies.

"The Marine Transportation Companies.

"The Street Railway Companies.

"In case of failure of any of said organizations or interests to nominate, then these members are to be appointed by the Mayor, and each shall be chosen for his known qualifications with respect to the interests which shall have failed to certify its nominations.

"SECTION 3. Any member of such commission may hold any other office whether federal, state, county or municipal or may be an employee of the city or of any other department, commission, board, bureau, institution or office of the city government, and by becoming a member of such commission, no person shall forfeit any other public office or employment which he may hold at the time he becomes a member.

"SECTION 4. Before entering upon the duties of their office, all members shall qualify by taking the oath of office prescribed for city officials in the City Charter, and shall organize by electing a president and secretary.

"SECTION 5. After the organization of such commission, any member except a state, county or city official, who shall be absent from the meetings of said commission for a period of more than thirty days, without being excused therefrom, shall ipso facto forfeit his office; and any vacancies caused either by resignation, death or by reason of unexcused absence, shall be filled by appointment in the manner provided for in Section Two (2) of this Resolution; such new commissioner to be chosen to represent the same body as that represented by the one causing the vacancy. The failure of a city official to retain his office in the city government shall be considered a vacancy on said commission and his successor shall be selected as hereinafter provided.

"SECTION 6. All members shall serve without compensation.

"SECTION 7. There shall be furnished to said commission suitable quarters for the carrying on of its investigations, together with such engineering and clerical assistance as

may be necessary, and the commission shall, as soon as practicable after its organization, employ one or more, but in no case to exceed three, men of national reputation, recognized as authorities in city planning to prepare a comprehensive plan under its direction and subject to its approval and adoption, embracing in its scope the entire area of the city and such contiguous territory as is comprehended in Section One (1) of this Resolution. The final plans shall be submitted to the commission for approval, and shall be regarded as approved, unless rejected by a two-thirds vote of said commissioners within thirty (30) days after the same shall have been filed with the commission. The Municipal Plans Commission shall hold regular meetings; at least one such meeting every two weeks. Upon the conclusion of sittings of said commission it shall submit its findings in full to the Mayor and the City Council of Seattle in printed form, together with plans. Said report shall be presented to the Mayor and City Council not later than September 30, 1911, and they shall cause the recommendations of the commission to be submitted to the people at the next general or special election.

"SECTION 8. That if a majority of the voters voting thereon shall favor the adoption of said City Plan so reported, it shall be adopted and shall be the plan to be followed by all City officials in the growth, evolution and development of the said City of Seattle, until modified, or amended at some subsequent election.

"SECTION 9. There is hereby created a fund to be known as 'Municipal Plans Commission Fund,' which shall consist of a tax levy to be made during the year 1910 as other taxes are levied, of one-fourth (¼) of a mill on the dollar, but no other or further levy or payment into said fund shall ever be made. The Municipal Plans Commission shall have exclusive power to pay out moneys from such fund for any and all purposes specified in Section One (1) hereof, and shall, on or before the 10th day of August of the year 1910, prepare and submit to the City Council for approval and adoption, an estimate of the amount of money which may

be required for its purpose, in conformity with Chapter 138 of the Laws of State of Washington, Session 1909.

"SECTION 10. All expenditures on account of work done shall be made upon vouchers approved by a majority vote of the Municipal Plans Commission and signed by its president and secretary. Each voucher shall, when accompanied by a detailed statement of such expenditures, be certified to the City Comptroller, and shall be paid by the Treasurer out of any money in the Municipal Plans Commission Fund not otherwise appropriated. Said commission may anticipate the revenues to be paid into said fund under the tax levy herein provided for, by the issuance of its warrants against said fund, to provide money for the necessary expenses of said commission prior to the availability of the funds to be raised by such levy. No expense against such fund shall be incurred after September 30, 1911, nor in excess of the levy provided, and any surplus remaining in said fund after said date not lawfully appropriated or obligated for shall be by ordinance transferred into the General Fund."

An example of a very serious defect in city planning in a great many cities in the United States, is seen in paragraph ten, which provides that no expense shall be incurred after a certain fixed date. Such a provision brings the whole work to a stop at the fixed date, and subjects its continuance to the vicissitudes of politics, which may cause the abandonment of the entire project or a revising of the original plans for interested purposes. Such a commission should, in all cases, have power to continue the work uninterruptedly.

After the plan is approved by a body that has final legal authority, the city appropriates the money, and the condemnation of property and the actual work proceed.

By a proper management of the condemnation proceedings, the cost of city planning can be greatly reduced or even be made a source of immediate, direct profit. This is accomplished by giving the city power to condemn not only the land actually needed for an improvement, but as much land adjacent as may be thought desirable. After the im-

provement is made the city re-sells the abutting property to private users at the prices which it then commands by reason of the improvement. The city thus often realizes in re-sales more than the cost of the lands and the improvement. Speculation in real estate, inflation of values and the enriching of land-owners at the expense of the city as a whole is thus prevented. This is merely the direct benefit of city planning, and does not take into consideration the enormous benefits from increase of population, industry, and commerce and better living conditions, etc., as previously outlined.

The greatest piece of city planning now in progress is in the city of Berlin. It has been going on for several years, and will involve before its completion, the expenditure of over 320,000,000 marks ($80,000,000).

When it comes, however, to the expenditure of such great sums as this, a more complete organization is necessary. The main commission appoints sub-committees composed of engineers and architects, and such sub-committees have charge of different portions of the work. These committees include Plan and Scope, Streets, Public Buildings, Parks, Waterways, Piers and Docks, Water Supply, Sanitation and Drainage, Lighting, Public Baths, Athletic and Recreation Grounds, Municipal Traction, Tree and Floral Culture, etc.

These divisions may be anticipated to a certain extent in the original organization of the City Planning Commission, so that when the final organization is effected, the duties of its various constituents are fairly well understood.

The fact that a movement of this character is being undertaken by a city, gives it no small added prestige. The value to the city and the citizen which is had in a well-planned city begins to make itself felt even when the plans are only begun. Such a movement distinguishes a city as progressive and patriotic and brings about an entirely new attitude of thought, both of the citizen towards the city and of the citizens of other cities toward it.

No work any more important or beneficial to a city can be undertaken by any public-spirited citizen, than to initiate

or participate in a city planning movement. The work done at such a time will remain as long as the city exists as the achievement of its founders, and will mark their generation as one of progress and enlightenment.

The present condition of most American cities, while deplorable in itself, affords opportunities for the display of disinterested public spirit, which once taken advantage of, will occupy the field for all time. Paris, for example, can afford no opportunity for a second Haussmann or Washington for a second L'Enfant. Yet almost every American city is crying for some genius to come forward and reorganize its stupidly conceived and carelessly executed plan and for public-spirited citizens to initiate the work.

This is just as important for the small city as the large one, and especially so for the small city which is growing rapidly. A proper plan, taking into consideration its possible future expansion, will stimulate its growth as nothing else can, and the development along the plan will save enormous expense later on.

CHAPTER III

THE CIVIC CENTER

Federal, Municipal, Traffic, Social, Amusement, Educational and Shipping Centers

THE civic center is the heart of a city's design. It gives the city its vital individuality, and imparts a sense of unity and cohesion which cannot be obtained in any other manner. A city with a suitable civic center no longer gives the impression of being an accidental conglomeration of buildings; it becomes an organized whole and gains a new dignity and a new meaning.

It is possible for every city to have a suitable plan, and every city, if it is not built on such a plan, should be re-planned and re-built. The lack of design is the outcome of carelessness and ignorance on the part of the city authorities of earlier administrations. The absence of such a plan is a detriment and an injury to all who make the city their home.

In many cities, however, the legacy of carelessness and incompetency proves too heavy to be lifted immediately, while in others the development of an elaborate system is beyond their financial resources.

In every case, however, it is possible to adopt a plan which may, little by little, be carried into execution, with ultimately the greatest beneficial results.

Not only motives of civic pride and patriotism go to make the civic center desirable, but also the strongest motives of social and municipal economy and efficiency.

A civic center should contain, except in cities of large size where more than one center is required, the municipal and federal buildings, such as the city hall, court house, hall of records, post office, federal court building and various city departmental buildings.

PALACE OF JUSTICE, MUNICH
A well-located civic building

CITY HALL AND MUNICIPAL COURTS, CIVIC CENTER OF ST. LOUIS

KÖNIGSBERG, BISMARK'S MONUMENT AND CASTLE

Thrown into view by the curved street plan

The civic center should, of course, have a central location and be readily accessible from all parts of the city and surrounding suburban districts. Several main arteries of traffic should radiate from the civic center, making it the center of the city's street plan, the keystone in the arch of its design.

Such a civic center can scarcely be too large in area, and, however expensive this may prove as an initial outlay, it will be of the greatest ultimate benefit.

The civic center should be of ample size for several important reasons.

The grouped buildings gain greatly in effect when seen from proper distances, and this stimulates the imagination and impresses the observer with the power and dignity of the city.

The placing of the buildings thus upon a large open space enables them to appear to the best advantage, and they form a dignified and imposing whole. This is highly gratifying in a psychological sense, being the best expression of what a city is, the point at which man can get furtherest away from the isolation of rural life. In a civic center the spirit of collective life reaches its highest manifestation. It is thus far more than a mere collection of buildings around an open space, becoming a means of satisfying one of the strongest of human instincts, that of gregariousness.

A civic center of large extent, in addition to its artistic and psychological effect, is of great value as a place for the assembling of large numbers of people on great public occasions. It is a central point for the reviewing of parades and for the reception of noted visitors to the city. The mistake most likely to be made in planning a civic center is to make it too small in area. The expense of a large center, though usually very great, is one that should be incurred as early as practicable in the existence of the city, for as the value of the ground increases constantly, it is an investment which never depreciates in value. It is a matter of wisdom for a city contemplating civic improvements to purchase the necessary land and lease it until the time comes for the actual re-building, ten or twenty years later.

With buildings grouped together in a civic center, a far more magnificent effect is produced than is possible with the same buildings isolated in different parts of the city.

It is also vastly more convenient to have the city administrative buildings grouped in one place, as those having business with the different departments can transact it much more readily and without the waste of time that would be

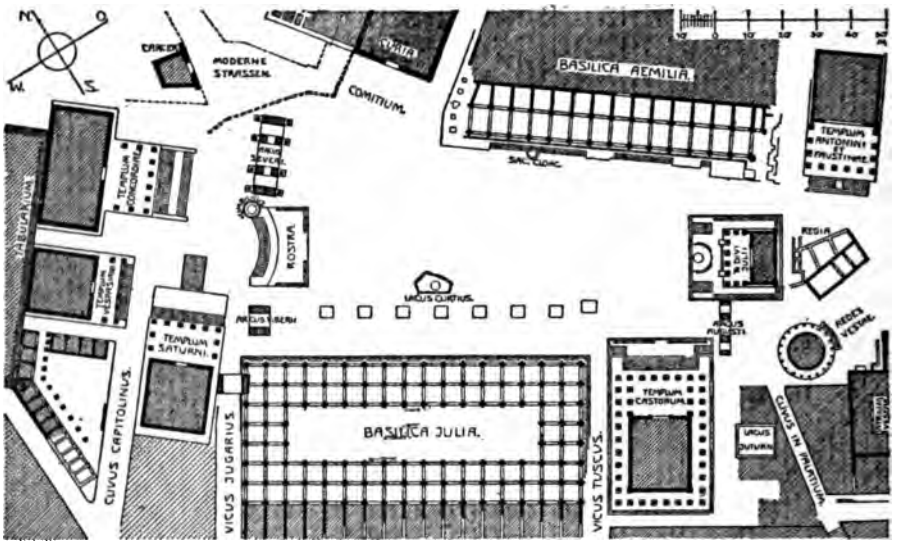


FIG. 1. GENERAL PLAN OF THE ROMAN FORUM IN THE TIMES OF THE CÆSARS

involved in travelling from place to place in the city, as is the case when such buildings are located at haphazard.

There is, in fact, no valid argument against the formation of civic centers and everything in their favor. The reason they exist in so few American cities is largely because of lack of education on the subject, and the consequent ignorance of the advantages arising from this form of construction, for which architects and engineers are largely responsible.

The political organization of cities has also had a share in this failure to have cities properly planned, since the work of city planning is one that requires years for its completion, and the constant changes of administration, with hostility in one to the achievements of the previous one, or of one of

another party, has operated to the great disadvantage of American cities.

Lack of appreciation of the beauties of architecture has also contributed to the present heterogeneous aspect of our cities, and ignorance of their art on the part of architects has been largely responsible for this. Anybody who can draw a few lines on paper is at liberty to set himself up as an architect, and real study of this great art is much neglected, so much so in fact that the average citizen could by no means name three of the leading architects of the country.

The proper location of the civic center is as important as its size and arrangement, and in selecting its location, a long look into the future should be taken.

Even at the expense of some present inconvenience it should be placed near what will be the center of the city, when it reaches a certain growth. The location of the civic center may thus give direction to the growth of the city which might otherwise develop along lines of least resistance or as encouraged by real estate speculators.

The civic center should be so placed as to be easily accessible to all parts of the city, and if necessary, new avenues and streets should be cut through to afford the proper approach. It should be conveniently placed with reference to transportation lines, but no transportation line should penetrate it, passing at most along the sides. Nor should traffic from bridges, elevated stations, subways, ferries or railway stations be discharged directly into the civic center, such terminals being more advantageously placed adjacent to it. It should not, thus, be an artery of traffic, but so to speak, the center of the whirlpool of the city's transportation.

The buildings to be included in a civic center should be the city hall, court house, hall of records, post office and federal court, custom house, administrative buildings for the various city departments, and possibly some buildings of a commercial character, either in the civic center or adjacent thereto and contributing to its general effect, such as a chamber of commerce, banks, and life insurance buildings.

The leading principle of the design of a civic center is that one of the buildings should dominate the rest. This should usually be the city hall or court house. The other buildings should be in character and style related to the dominant building, but not of such size or outline as to detract from its importance, as it should be, in an artistic sense, protective of the others. Another important principle of the civic center is balance, the buildings being so proportioned and placed with reference to each other, that their masses and outlines produce a pleasing effect. The design of a civic center is indeed an artistic problem of the first magnitude, in which the principles of art are manifested on a great scale. It is a painting with the sky and the city as a background, a sculpture in masses, and it should have unity, strength, feeling, completeness, balance and splendor. The art of the civic architect is thus one in which the greatest talents may find opportunities for expression not obtainable in any other art.

In cities of considerable size, it is advisable to have additional civic centers to supplement the principal center.

Such additional centers may be of a somewhat different character. For example, there might be a federal center, containing the post office, custom house and federal court house. Other centers might be a traffic center, a social center, an educational center, an amusement center and a shipping center. In cities of very large size, a third class of centers, more numerous, and of a composite character could be provided.

A traffic center would be composed of one or several of the railway terminals. These should be located in near proximity, on civic center lines if it is not feasible to have a union station, so that a ready transfer of passengers may be accomplished. In the traffic center should also be located terminals of the street railways and also, particularly, terminals of suburban electric lines. A center of this kind is of the greatest utility and convenience, and is especially of the greatest service to visitors, enabling them to find their way about without loss of time. The first impression of the

visitor is that received from the traffic center, and from the means provided whereby he can conveniently reach his destination, which is not in reality the railway station, but the place in which he is to live.

It is therefore important to have such a center properly arranged, and to so direct city traffic lines that all portions of the city are readily accessible from the traffic center.

The social center should be located nearer the residential portion of the city, and should consist of museum buildings, art galleries, a library and an exhibition hall, suitable for expositions of various kinds. The buildings of the social center should be of a somewhat different character from the buildings of the municipal group, indicating their purpose by being less severe, and more delicate in architectural treatment.

An amusement center of the proper kind is difficult to establish in America, owing to the fact that theatres are all private ventures. Abroad, the state and municipal owned theatres, and the ability of the cities to regulate the design of other buildings, enable such centers to be readily established.

It is the practice in America to build theatres in the middle of blocks with but a narrow entrance façade on the street, or where the theatre has some street frontage, to confine it to a rather flat façade usually of an uninteresting design, with small stores along the street. One of the ugliest of amusement buildings in America is the Metropolitan Opera House, which should be the finest. While it occupies an entire block, it is of a barn-like appearance, houses a restaurant and a bank on the Broadway front, has apartments to let and on the Seventh Avenue side is graced by a corrugated iron lean-to, from which is suspended a canvas curtain, the recess thus formed being used to store scenery.

Under proper regulations, the theatres of a city should be arranged around a square or in a well-planned district, and each should be an independent building of a design approved by an art commission prior to its erection. The amusement center might also contain restaurants, concert halls and lecture halls, all arranged on a definite plan and properly

related to each other. Suitable provision should also be made for the parking of automobiles during performances, and this regulation might even proceed to the time of dismissal of the audiences, which could readily be varied within certain limits, to prevent congestion in the streets, such as produces so much confusion, for example, in the New York City theatre district, which is in all respects a triumph of the haphazard, and a nightmare of the unregulated.

In this district until recently, no restrictions other than those of a commercial nature have had any consideration, and the result is that the theatres are stuck anywhere that room can be found. The recent restriction is one relating to safety in case of fire, and is the requirement of a narrow alley all around a theatre, which makes the theatres even more unsightly than before.

In illumination, huge and glaring electric signs have been permitted to litter the roofs of buildings having any position of advantage, and with unexampled effrontery, to make night hideous with their intermittent flashings of recommendations of various articles of commerce and trade. All this is an excellent illustration of the small consideration private enterprise has for public interest when it is allowed to have its own way. Instead of a stately and beautiful square with imposing structures, suitably illuminated, there exists a confused mass of buildings with theatres sandwiched into all sorts of corners, and a great number of obnoxious electrical signs stuck everywhere, each trying to be uglier and more annoying than its neighbor.

This, the far-famed Great White Way, which might be more properly called a great blight way, yet all cities throughout the country, even to the smallest, are doing their best in imitation, strong in the belief that they are engaged in a most praiseworthy undertaking, and receiving no lack of encouragement in the good cause from the electric lighting companies and manufacturers of electric lamps.

A theatre center might be encouraged in American cities, by a remission of taxation on buildings which when erected had the sanction of the Municipal Art Commission of the

city. The reduction in running costs could be capitalized by the owners to enable them to produce a beautiful building, which would still be able to compete with the uglier and

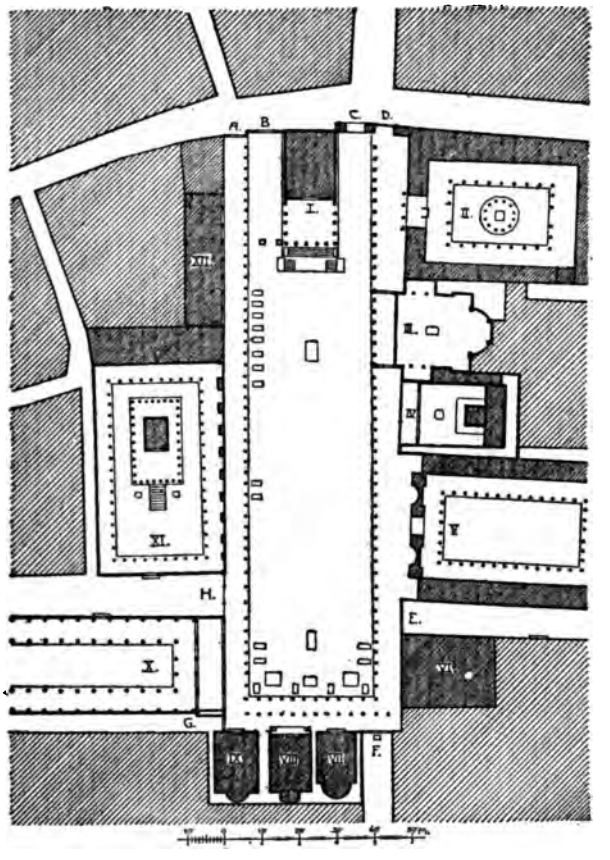


FIG. 2. FORUM AT POMPEII

I. Jupiter Temple; II. Market Hall for Household Goods; III. Court; IV. Temple of Vespasian; V. Market Hall for Woolen Goods; VI. Comitium; VII, VIII, IX. Administrative Offices; X. Basilica; XI. Temple of Apollo; XII. Market Hall.

cheaper ones placed to utilize low-priced land. This would be a form of subsidy quite as useful as the present general subsidizing of churches by remission of taxation, a subsidy which enables churches to be placed to great advantage.

An education center could be composed of a college or seminary, public high school, school administration building, a library and a medical college and hospital. The large universities of the United States with their grounds and

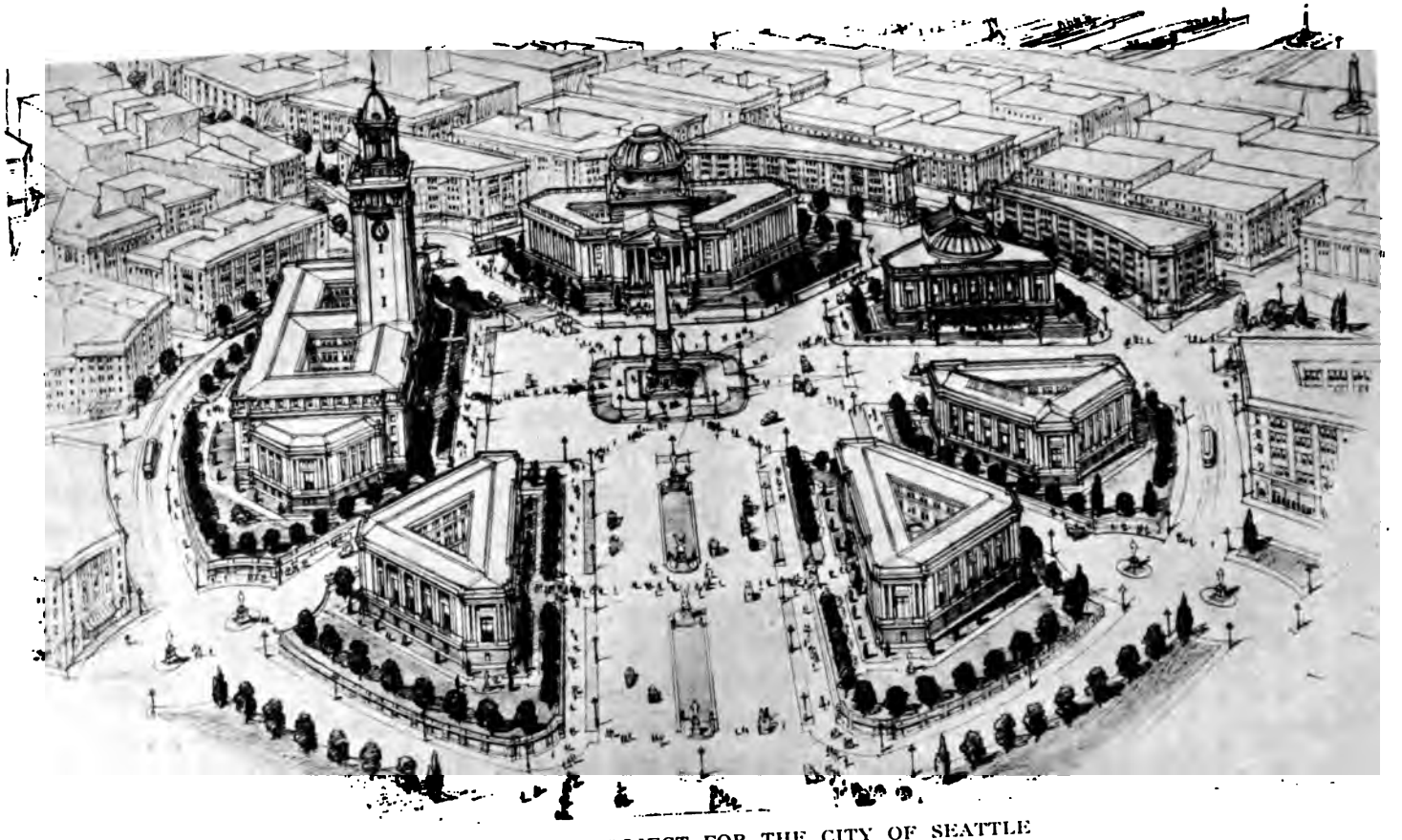
buildings are in effect education centers, and in their arrangement of buildings are considerably superior to most European universities. This is to be accounted for by the fact that commercial considerations do not enter into educational affairs. Columbia University in New York forms a notable educational center and if a broad avenue were cut through to relate it to St. Luke's Hospital and the now building Cathedral of St. John, this section of the city would be greatly improved and unified. New York University with its Hall of Fame and other buildings, on University Heights, is a further educational center of national importance enjoying greater area than Columbia, though more distantly placed, while the College of the City of New York, though less extensive, is also a striking and admirable center.

In this respect New York is fortunate, though in the location of its Public Library and museums, which are isolated and in gridiron blocks, it suffers from the stupidity of the originators of its street plan, which was modelled by city officials then in charge, after a gravel sieve.

Cities thus in which universities are located, and particularly cities which are capitals of states, have unusual possibilities, and may easily be made architecturally interesting, while other cities, devoted principally to commerce, have not the same occasion for striking buildings.

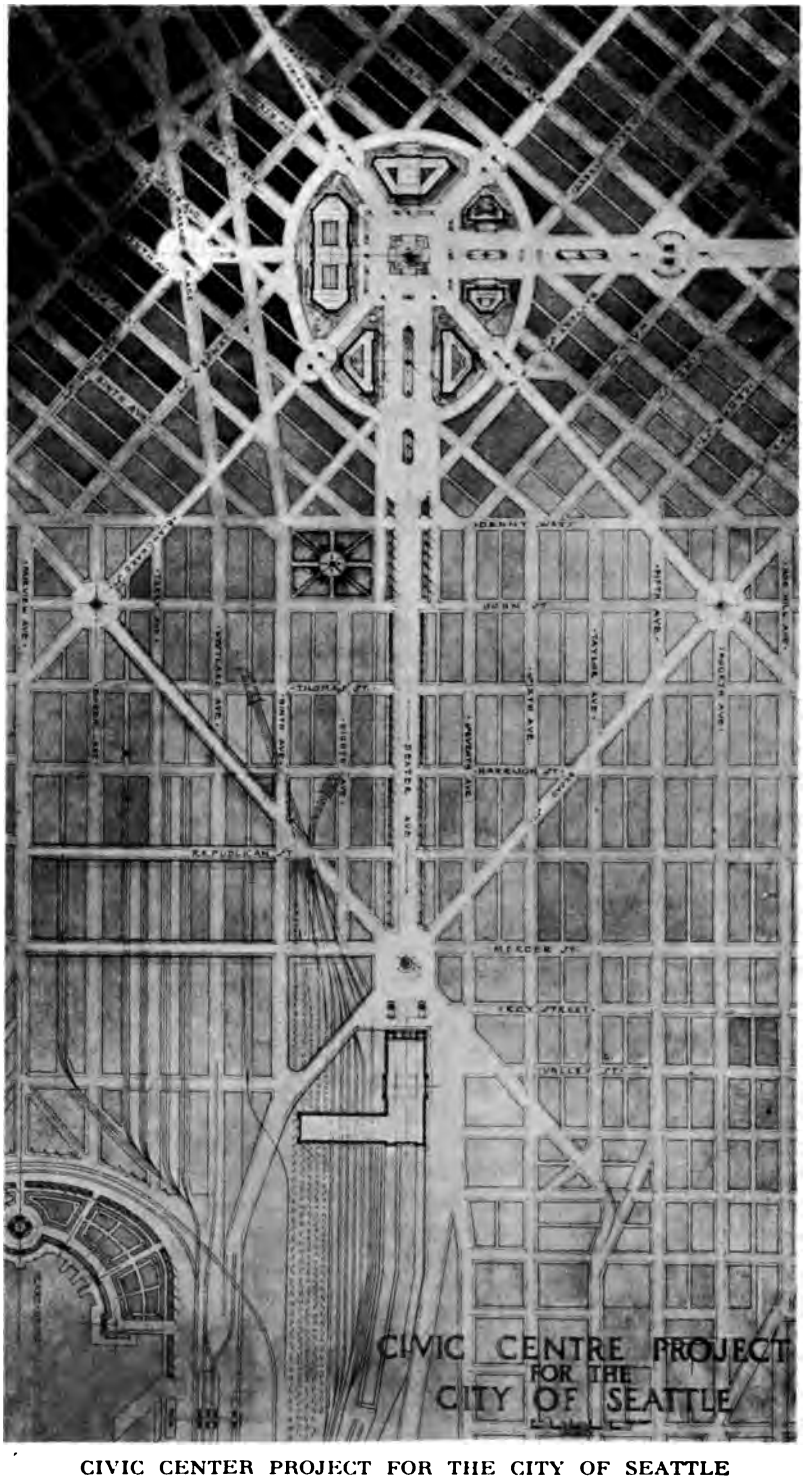
An instance of this is seen in the difference between Hartford and Bridgeport, in Connecticut, cities of nearly equal size, but of an entirely different appearance; the capitol building at Hartford and a fairly well arranged central portion being much more beautiful than the confusion of Bridgeport, or even New Haven, where the buildings of Yale University offer the only relief, and no very great relief at that.

A civic center of the greatest utility is the shipping center, which for freight and produce compares with the traffic center for travellers. A shipping center may be placed with advantage at the water front, and should contain railway freight terminals, piers and docks, municipal market houses, appraisers' stores, warehouses and buildings of a



CIVIC CENTER PROJECT FOR THE CITY OF SEATTLE

The principal administrative building dominates all the other buildings of the group



CIVIC CENTER PROJECT FOR THE CITY OF SEATTLE

Part of the Great Ground Plan

similar character. In planning a shipping center, it should be made spacious in the extreme, for convenience of drayage, as vehicular traffic becomes very quickly congested if sufficient street room is not provided. New York has an approximation of such a center in West Street, a very wide thoroughfare upon which the North River piers abut, and near which is a large freight station. In a properly planned shipping center, the railroad tracks should go directly into the piers, for convenience of transferring freight, as will be further referred to.

A division should be made between freight intended for use in the city itself and that which comes to the city as a point of distribution. This is a problem which very seriously affects cities which are railroad centers, and in Chicago such a division is proposed. In that city, the railroads run directly into the city and a great part of the tonnage is unloaded, taken to warehouses and stored until required for use in other cities. A great amount of freight also goes through the city without breaking bulk, the cars being switched from one railroad to another. This transfer of traffic occupies much of the capacity of the city's tracks and streets and causes great and unnecessary confusion. To avoid this and relieve congestion, it is proposed to establish a great freight and warehousing center southwest of the city, where transfer of freight cars from one railroad to another may be effected without delay and at little cost. As about 95 per cent of the freight traffic of Chicago is handled by rail and but 5 per cent by water, the location of such a center can with advantage be placed away from the lake front. An enormous saving will result to all concerned, the railroads transferring their cars with despatch, merchants and wholesalers loading and unloading by machinery where the work is now done by hand and the public being relieved of the noise, wear and tear and nuisance of much of the present street traffic, and the presence of large numbers of coal-consuming locomotives.

Æsthetic considerations do not, of course, enter so largely into the construction of a shipping center as they do in other

centers, the problem being more one of traffic engineering. The buildings, however, may profitably be designed along the lines that have proven efficient, and at the same time preserve a certain massiveness and sense of utility which will give the center its own unity and individuality.

In addition to the principal centers thus outlined, another kind of center is of great utility, and this may be called a regional center, that is the center of a certain district or region of a city. Such centers tend to develop themselves under normal conditions, but not being planned in advance, their usefulness and attractiveness are far less than should be the case.

Such regional centers should be located at different points throughout the city, at some distance from the main centers, and they should not be devoted to specific purposes, but should in effect be unified centers.

Such a center would contain, for example, a court building, a bank, a high school, branch library, theatre, museum, concert hall and other similar structures, arranged with reference to each other and with due allowance made for the future growth of the city.

Civic centers, with such additional regional centers, serve to render knowledge of localities in a city easy of acquisition. The child at school soon learns the location of the centers and each center, having its own individuality, is readily remembered. Strangers may similarly soon gain an acquaintance with the city. The psychological effect of civic centers is thus to give the city an individuality and to fix it in the mind as a well-ordered whole, instead of as an accidental conglomeration of buildings.

The advantage of the planning of a city on the principle of civic centers is indeed so great, that no other kind of plan receives any consideration. The fundamental principle of city planning is the civic center, and when the center has been properly planned and placed, the remainder of the design is readily worked out.

The enormous importance to a city of being properly planned may be appreciated by considering the beauties of

the great cities of Europe: Athens, Venice, Florence, Rome, Nice, Vienna, Budapest, Dresden, Berlin, Munich, Düsseldorf, Moscow, Antwerp, Paris, London and other noted places. Their fame is largely, if not wholly due, to the fact that they contain structures of beauty properly massed and grouped, and that their streets are laid out in an orderly manner. If the important buildings in those cities were isolated and unrelated, they would never have enjoyed the fame and dignity which their names imply.

American cities, though not as old, are not inferior, in size, commerce or wealth, but who ever goes to Jersey City, a larger city than Düsseldorf; to Nashville, greater than Athens; to Detroit, with a larger population than Rome; to St. Louis, almost the equal of Budapest; to Chicago, greater than Vienna or Berlin; to Baltimore or Pittsburg, superior to Dresden; to Minneapolis, larger than Antwerp, or to any of a score of American cities, to see any sights worth seeing?

American cities thus lack distinction and interest. With the exception of Washington and the skyscrapers of New York, no tourist ever seeks out an American city as a point of interest in itself.

Finding nothing at home to interest them, American visitors flock abroad, while Europeans themselves, much greater travellers than Americans, are constantly visiting and studying their own cities. A great stream of travel would flow to America from abroad and an enormous and enlightening amount of travel at home would result if American cities were worth seeing. Such travel is not only highly profitable to certain business interests of the cities visited but has a great educational effect on the travellers, who are better able to improve their own cities after seeing the accomplishments of others. With the exceptions noted, Washington and New York, and a few natural beauties, such as Niagara Falls, Mammoth Cave and Yellowstone Park, the traveller in America is utterly at a loss to know where to go to see anything worth while.

Even the smallest cities abroad have their own city improvement societies, whose business it is to make the city

and its environs attractive to visitors. Among minor cities in Germany which have been made highly attractive in this way are Essen, Duisburg, Dortmund and Barmen, all of which lie in the industrial district Rhineland-Westphalia, where city improvement would be the least expected.

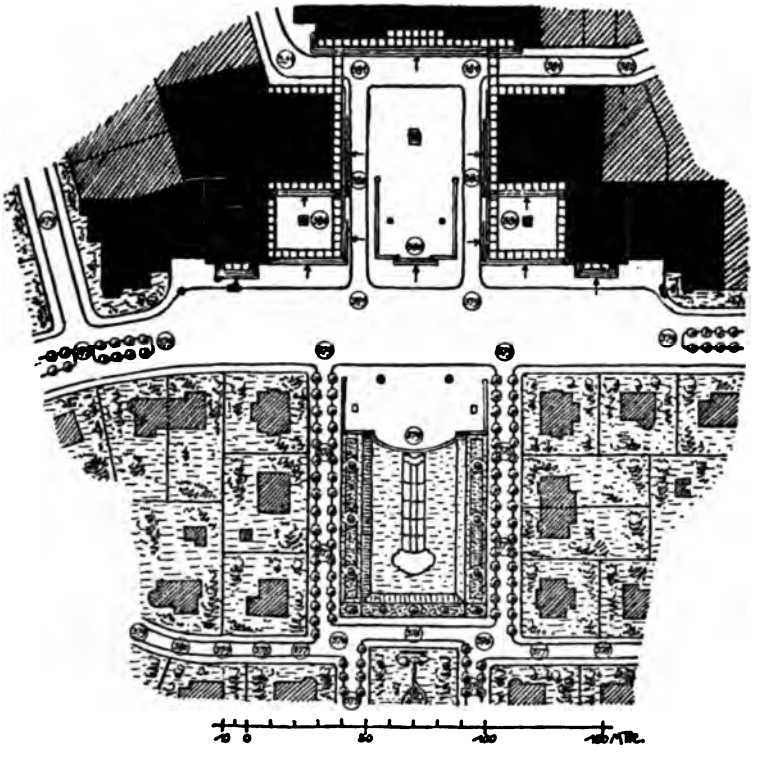
Many of the famous European cities have some dominant feature which is recalled when their name is mentioned, such as the canals of Venice, St. Peter's at Rome, the Kremlin at Moscow and Unter den Linden and the Brandenburgertor at Berlin, the Ring and the Prater at Vienna, the Louvre and Notre Dame at Paris, the Jungfernstieg at Hamburg, the Zeile at Frankfort, and Westminster Abbey and Hyde Park at London, which are notable examples, crystallizing, so to speak, the fame of the city.

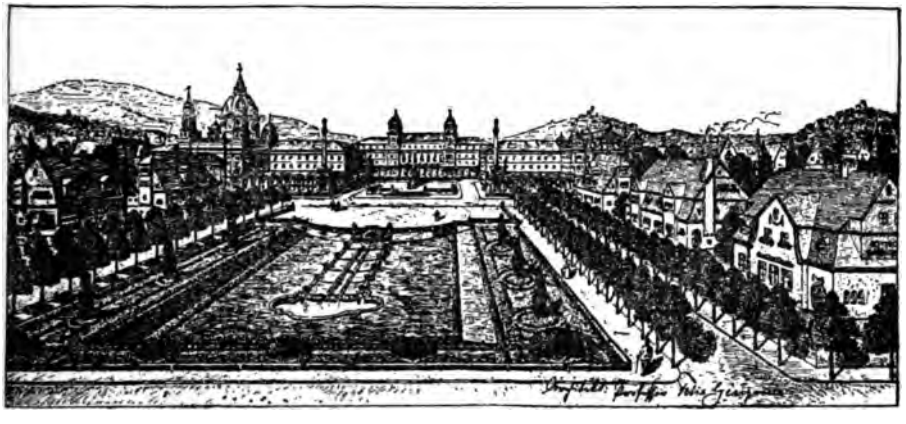
As in a civic center some one structure should be dominant, it is similarly desirable in a city to have some feature dominant and to devote the best energies of the city to its perfection. The city may thus gain distinction and fame more readily than by diffusing its energies.

The civic center need not necessarily be the most noted feature of a city, as such centers will be more or less similar in all cities, though some may make the civic center the leading feature. Among other single features which may be made distinctive are bridges, water and land approaches, embankments, drives, great avenues, promenades, monuments, squares, residential streets, parks, parkways, gardens, special styles of architecture followed throughout a district, museums, street outlays, theatres, churches, memorials, universities and the like.

Many European cities of small size have some features which are in some cases of natural origin, and in others of historical interest. For example, a "dying lion" carved in the natural stone of the mountain side draws many to Lucerne, while the towns near which battles have been fought, or where noted men were born or are buried, are also points of great interest.

Foreign cities are noted for special pursuits of their inhabitants in many cases, or of their products. The artists





FIGS. 3 AND 4. CIVIC CENTER

Proposed Plan for Hirschberg, Silesia

of Paris and Munich and in times past of Düsseldorf; the musicians of Vienna and Milano, the porcelains of Dresden, the violin makers of Mittelwalde, the toymakers of Nuremburg, the cuckoo clocks of Freiburg, the passion play of Oberammergau and similar features have made those places famous. Perhaps the most striking example of the advertisement of a city by such a special feature is the last mentioned, the passion play at Oberammergau, which though it takes place but one in ten years, has made the village famous, and travellers from all over the world visit it to the great enrichment of its inhabitants. Bayreuth, similarly, has been made famous by Wagner, while Mecca has not only become famous in itself from sheltering the remains of a religious fanatic, but has made its name a synonym for such travels.

The features of American cities which might be made objects of interest to travellers receive little or no attention. There are, for example, many tombs of former presidents which are utterly neglected. Various other features have been allowed to fall into obscurity which might be made of interest to visitors.

It should be the object of the city improvement society to advance the interests of the city in every possible way and to utilize such special features for the purpose of advertising the city, and when visitors arrive, to see that they meet with no obstacles in gratifying their desire to see the city.

A number of American cities of lesser size have first-class attractions, such as the steel works at Bethlehem, and the furniture factories of Grand Rapids, which would be of interest to many foreign travellers just as the cuckoo clocks of Freiburg draw American visitors; while localities have been made famous by men, such as Menlo Park by Edison, East Aurora by Elbert Hubbard, who tried to steal some Oberammergau thunder by advertising the presentation of its passion play in that town; while monuments such as those of Henry Clay at Lexington, Ky., Washington's Monument at Washington, Grant's Tomb in New York and Bunker Hill at Boston are already famous. The city of Albany has

THE ZWINGER, DRESDEN

OUTER BURGPLATZ WITH THE NEW HOFBURG, VIENNA

Striking examples of enclosed squares

CITY HALL, MUNICH

The focal point of several converging streets

recently scored strongly in respect of attracting visitors, through the erection of a building housing the Educational Administration of the state, which is claimed to be one of the ten most beautiful buildings in the world.

American cities are, however, waking up, and in the next few decades, should make great progress. America's wealth is drawing great art treasures from Europe and in civic improvement her cities will in time outstrip the cities of Europe. The Pennsylvania Terminal and the New Public Library in New York, for example, are structures which no European city is likely to surpass, and the movement for civic improvement, which is now beginning in many of the greatest cities throughout the country, cannot fail to have the most profound and inspiring results.

CHAPTER IV

THE GREAT GROUND PLAN

Zone or District Systems; Classification and Gradation of Districts; Individuality of Cities; Building Regulation

THE great ground plan of a city includes the whole lay-out of the streets, avenues, civic centers, parks, boulevards, piers, bridges, esplanades and grounds. In the planning of such a lay-out, the fundamental principle is that of the classification of districts according to their uses. The district units are to the whole city what the separate buildings are to the civic center, and the principal problem of the planning of a city is to get suitable arrangements of districts.

The whole purpose of city planning is to increase the health, comfort and convenience of the public, and in order to accomplish this, it is absolutely essential to have the districts properly arranged. In their planning the object is to give each man for his dollar the greatest value possible in housing and business convenience, proportionate to his income; that is to say, the man of small income must be given the same quantity of accommodations for the proportion of his income that he can devote to such purpose, as the man of large income; the only difference being in quality. Thus a mechanic, in renting a six-room house for his family, should not have to pay for it a greater proportion of his income than the higher salaried manager pays of his income in renting a six-room apartment for his family, the difference in actual amount being represented by quality.

The more numerous classes should always be able to obtain adequate quantities of whatever may be requisite to satisfy their needs, with only the expenditure of a fair proportion of their income.

This can only be accomplished by the establishment of classified districts and a rigid enforcement of proper regulations. This is the real kernel of city planning, compared with which its architectural embellishment is merely a polishing of the shell.

Each city has its own problem. Its classification must proceed in accordance with the results to be achieved and with the nature of its activities and business. For example, New York, with its varied industries and activities, needs a greater number of classifications and a greater flexibility in their application than Washington, which is more devoted to administrative and social purposes.

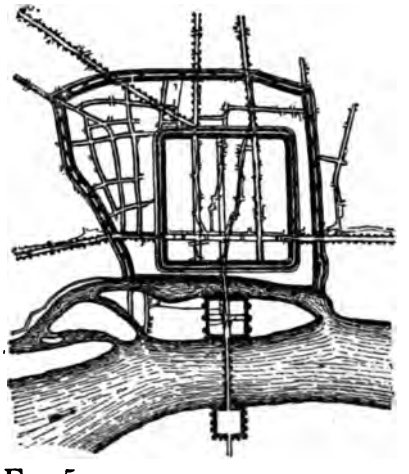


FIG. 5. GROUND PLAN OF ROMAN BUILT COLOGNE ON THE RHINE

The Site of which is to-day occupied by the central portion of modern Cologne in which the same Street Scheme is preserved and amplified, as is the case with many sites originally built on by the Romans in what is now Germany.

Suitable laws must be enacted under which the necessary regulations can be carried out, and through which citizens will be protected in their rights and prevented from interfering with the rights of others.

Objectors to such regulations will be numerous, but it is only necessary to recall that in sporadic cases, such systems of regulation exist and are carried out with even greater severity than may often be necessary. On certain streets, for example, no commercial traffic is allowed, while on others no peddlers can sell goods. On the other hand, a millinery or similar establishment is at liberty at any time to move in and spoil a whole residential block, to be followed shortly by laundries and bootmakers.

In the laying out of districts, the objects to be accomplished are the providing of healthful living and working conditions, prevention of congestion, convenience of distribution, suitable relation of the homes of the workers to their

places of employment, and the grouping together of those whose incomes and tastes are generally similar.

In European districts, the classes of districts are often a dozen or more in number. The city of Karlsruhe, with a population of 135,000, has as many as sixteen classifications, ranging from high-class residential to detached suburban houses, and civic center to factory districts.

Owing to the hitherto unregulated conditions, it would not now be practicable in most American cities to establish as many districts, or as close a classification.

A workable classification for the average American city might be as follows:

Residential District,	No. 1	Light Traffic, no stores
" "	No. 2	Medium Traffic, stores
Business District,	No. 1	Medium Traffic
" "	No. 2	Heavy Traffic
Industrial District,	No. 1	25 to 100 employees per establishment
" "	No. 2	Over 100 employees per establishment
Tenement District		Stores and heavy traffic
Warehousing District		Heavy traffic

In making such classifications, however, the city should not be divided in such a manner as to confine the poorer classes in the parts of the city remote from those in which the better classes are housed, as such residential restrictions would prove unpopular.

The better plan is to have a gradual improvement of the residential sections from the extremity of tenements or low-priced cottages on one side to private residences with extensive grounds on the other; the poorer citizens thus not being compelled to live in a section of the city of a fixed character, but being able to move into better quarters from time to time as their means improved, forming new acquaintanceships and gradually getting out of the reach of others, as by successive moves they come to occupy better quarters.

In such an arrangement of the sections of a city into graded zones, the differences between one zone and the next

would not be great in degree. They should, nevertheless, be strictly adhered to, in order to preserve the character of the different portions of the city, and prevent undesirable changes, mostly due to the efforts of real estate speculators.

In Germany, where city planning has developed into a science of the first importance, such regulations provide that

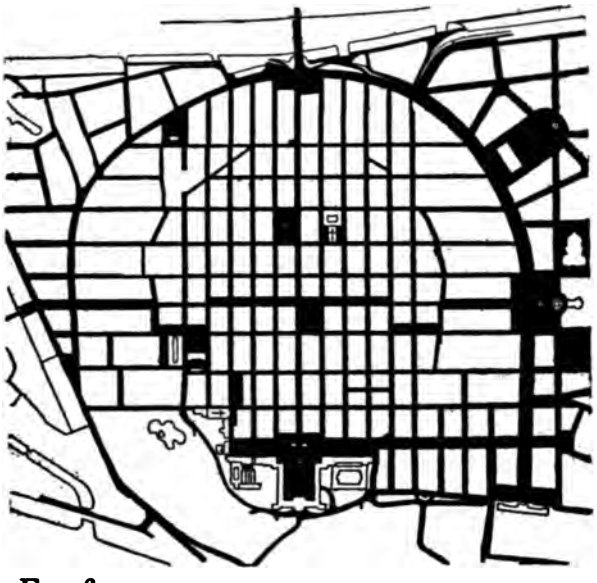


FIG. 6. GREAT GROUND PLAN OF MANNHEIM

A plan which with its horseshoe has proven highly satisfactory. It offers a solution of street replanning for American cities with their gridirons, and has been followed in the proposed plans of Chicago and other cities.

in certain zones, only buildings conforming to certain standards shall be erected.

Such regulations apply not only to residences but also to business buildings, and the business streets conform to their standards just as do the residential streets.

In the laying out of German cities a spirit of adaptability prevails, which gives the cities variety, and at the same time effects the necessary regulation.

Thus, for example, if there are a dozen kinds of classifications prescribed, the city is not laid out rigidly into twelve parts and each part given a certain character, but each group of blocks of the city is considered and its future character

determined, it being set apart in accordance with the characteristics of one of the twelve kinds of classification, which may cause it to differ to a considerable extent from the adjoining group of blocks. The dividing lines, however, between classifications may occur even in a block, one side or end being developed in one way and the other in another way. Thus though there may be but twelve kinds of classifications, there will be many hundreds of small zones, arranged to the best possible advantage but in all of only twelve kinds. The gradation of zones is consequently such that sharp lines of demarkation do not occur.

In its general outlines, the planning of a city must follow certain artistic and engineering principles, but in addition, as has been noted, each city offers its own problems, which must be considered with the utmost care and solved with the aid of expert advice and experience.

So many considerations of importance enter into the question of the laying out of a city, and in its reconstruction, that it should not be undertaken without the assistance of the most competent civic engineers and architects.

The principal units which must be considered in laying out the city's great ground plan, are the civic center section, the banking and office building section, the wholesale district, the manufacturing district, the warehouse district, retail stores, amusements, social centers, food products districts, terminals, miscellaneous industries, light and heavy, parks and recreation grounds and special school and college grounds, and in the remodelling of cities and the laying out of city blocks, these various constituents must be considered in their relations to each other. This involves various forms of communication, such as streams of traffic, land and water transportation, both of passengers and products, and a consideration of the sources of the city's raw materials and the methods whereby they are transported to and from the city. A seaport city or one on a river offers an entirely different problem from the inland city, drawing all its supplies by rail.

The future expansion of a city is also one of the most

PLACE DU CHATELET, PARIS

Effective focal point and boulevard treatment of a traffic waterway. An example of a bridge without portals, which would have detracted from the value of the monumental column at the focal point

GARDEN OF THE TUILERIES AND THE RUE DE RIVOLI, PARIS

An example of a long, straight street without interruptions, characteristic of Haussmann's layout; embellished with movable plants

important problems of the civic engineer, and the most careful attention should be paid to the probable direction of its growth, the presence of natural obstacles and of natural incentives to growth.

The problem of the civic engineer will be greatly simplified in this respect, if proper regulations are enforced, as growth along the most desirable avenues can then be stimulated, and the deflections incident to real estate speculation and other causes avoided.

Presuming that the civic engineer is in position to plan the city with the assurance that regulations will be such

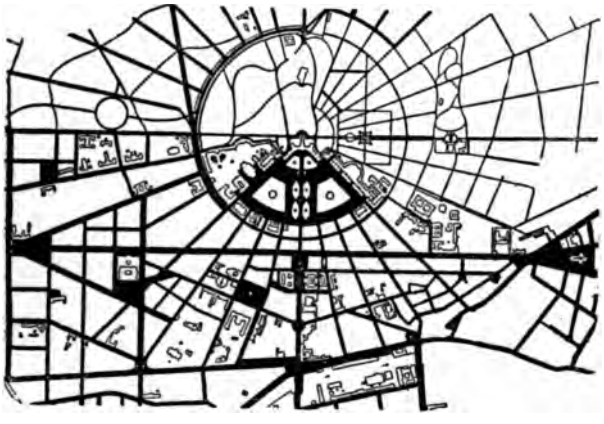


FIG. 7. GREAT GROUND PLAN, KARLSRUHE

An exceptionally well-planned city, full of individuality and variety. The portion above the median line of the great circle is a forest park. The building regulations provide for sixteen zones.

that the plan will be carried out; perhaps the most nearly ideal ground plan, from a theoretical point of view, is that in which the main civic center is placed in the center of the city, with concentric circumferential streets at intervals surrounding it, interconnected with radial, diagonal and transverse streets.

Such a plan, which may be termed the circular plan, while showing up well on paper, is not without its serious disadvantages, and it does not work out in practice as satisfactorily as might be supposed. Circumferential streets become just as monotonous as straight streets, and to

relieve this effect, diagonal and transverse streets must be cut through, producing the necessary focal points, but at considerable waste of small irregular shaped spaces. The effect produced is of a city with little or no individuality. The circular plan is, so to speak, a machine-made plan, and its adoption would result in a sort of standardized city, all monotonously similar to each other.

In order to have individuality of its own, a city must be composed of portions each of which has its own individuality. This individuality is dependent upon its street plan, its buildings, and the way in which they are arranged to strike the eye. In order that a portion of a city may have its own individuality, it must in some way be demarked from the remainder. Such demarkation cannot be accomplished when all the streets run to great lengths, as mere extent defeats the sense of unity, presenting so much for the eye to see and the mind to grasp that any feeling of individuality is lost.

Streets should not, therefore, be of great and indefinite length. Even the most important avenues should run from one point to another, and not be extended out into the rural districts.

Similarly, local streets should have definite limits, and their length should be less if they are narrow than if they are wide. They may often, with advantage, terminate against other streets in T or L plan, or they may be placed out of parallel and at varying distances, since uniformity in the length of blocks defeats the sense of individuality also. In local parts of the city, the eye should always find an object on which to fall, either of buildings at the ends of streets, monuments at intersections or other streets diverging. Only on getting out into the main avenues should comparatively long vistas be found.

The principles outlined are the fruit of the experience of city builders of the past, applied to modern conditions, and the past has been full of mistakes. Many cities have been built on more or less idealized plans, and while in some such cases, the result has been pleasing from an æsthetic point

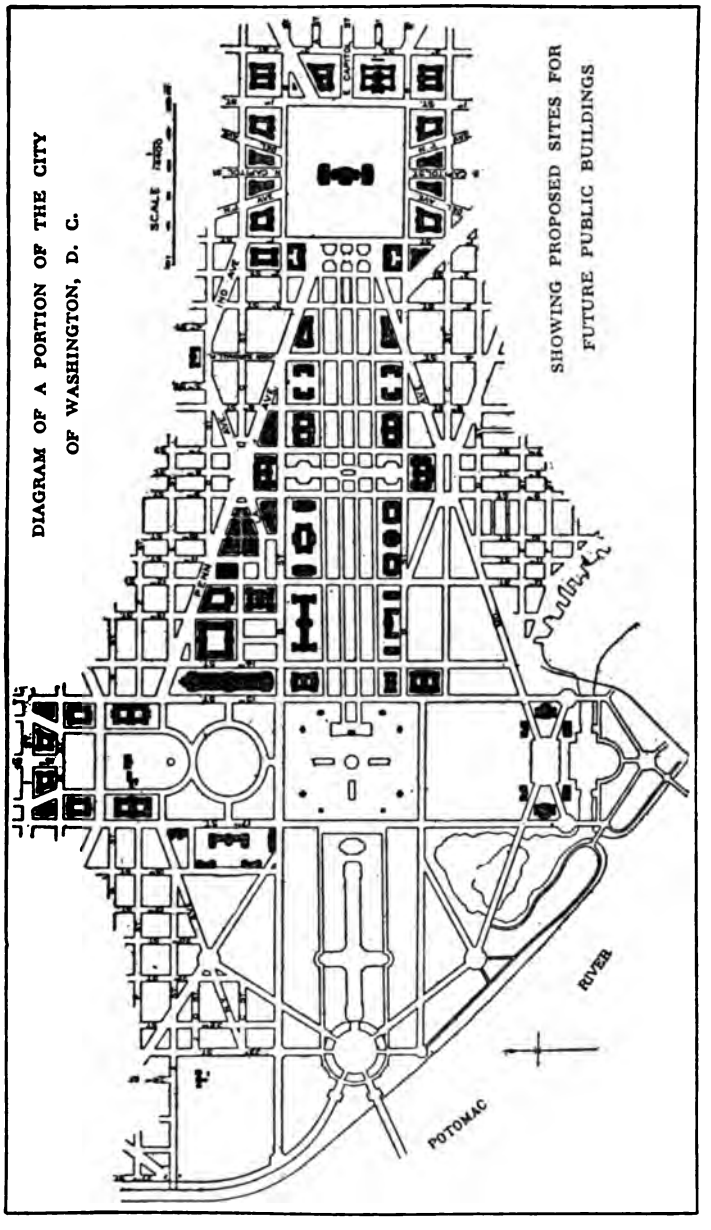


FIG. 8. A RECENT AMPLIFICATION OF L'ENFANT'S ORIGINAL PLAN OF WASHINGTON, D.C.

of view, the tendency has been to pay too little consideration to individuality, and little if any to practical considerations and industrial developments.

The utility of the city, as distinguished from its beautification, demands a greater degree of attention than has been accorded it, and the response to this demand by German cities has been largely responsible for their progress.

The German city building movement produced great, practical city builders, and as a result of their labors, the United Society of German Architects and Engineers, in 1874, laid down the fundamental principles of city planning as follows:

"The basic principles of enlarging a city, considered from the technical, the economical and the administrative points of view are:

"(1) The scope of city planning consists principally in fixing the base lines of all traffic movements and transit facilities, viz.: streets, street cars, railroads and canals, which must be treated liberally and systematically.

"(2) The street net should contain the main streets, with the existing streets taken duly into consideration; the auxiliary streets which are fixed by local conditions, and in addition, other subordinate streets, treated in accordance with the necessities of the immediate future, or having their development placed in the hands of interested property owners.

"(3) The grouping of the parts of the city should be effected in accordance with their location and individual characteristics, subject to such modifications as may be demanded by sanitary considerations and the exigencies of commerce and industry.

"(4) The duty of the building department is to determine the rights and privileges of tenant and neighbor and house owner. Such rights and privileges are related to fire protection, freedom from interference, health, and safety of buildings, and all æsthetic considerations must be secondary thereto.

"(5) It is desirable that expropriation and impropriation be facilitated by legal measures, and of still more importance is the creation of a law providing for the regulation of the contour of new or reconstructed blocks to be built upon.

"(6) The city should be reimbursed by property holders directly benefited by improvements for funds advanced by the city for such purposes, and it is advisable to have the amount stipulated before the work is begun and a normal cost per front foot fixed.

"(7) The activities of interested property owners' associations, in regard to the improvement of certain sections, should be subject to municipal supervision.

"(8) Land upon which it is imperative to make improvements should only be built upon under reservations for its subsequent use by the city.

"The property owner whose land has been marked out for street improvements should be entitled to demand expropriation with compensation, in the event of delay in making the improvements.

"The installation of sewer connections to new buildings must be at the expense of the property holder, but the city should be obligated to install a complete system upon the guarantees of a sufficient number of property owners of abutting property."

As has been pointed out, the work of Baumeister is preeminent among the great practical city builders, and excerpts from his book, "Stadterweiterungen in technischer, baupolizeilicher und wirtschaftlicher Beziehung" (1876), are of the greatest interest.

"In the city of the future, there will be three principal divisions; a business section as a core, an industrial district, including possibly wholesaling, and a residential district. It is therefore important that all large cities of the future, from the outset, should keep these principles in view. It must be recognized that the development of a city is confined to these three divisions and that they are interdependent in their development, though for the necessities

of an immediate future, piecemeal progress may be made with subordinate projects.

"To each basic division belongs main streets, railroads and drainage canals, together with the grouping of industrial districts and the selection of places for public buildings and promenades. The immediate object is not to complete the planning at once, but to gain control of the ground which will be needed.

"In a good street net, distinction must be made between the main streets and the auxiliary streets. There must not only be variety in the city as a whole, but also in its various districts.

"Symmetry in grouping of buildings, picturesque perspective of streets and places and well-chosen points of observation, and attractive successions of buildings constitute the individual elements of a satisfactory architectural impression.

"The straight stretches of the arterial highways of the city should gradually be transformed as the suburbs are reached, into forms more characteristic of rural life, with curves and deflections. While additional time will be consumed in traversing such streets, the life of the city has been left behind and the enjoyments of the country reached. The further such avenues proceed, the more rural in character should they become.

"The historically trained artist turns naturally in contemplation to the past. He reconstructs in his imagination the admirable structures of antiquity, and delights in present picturesque examples of the middle ages, such as seen at Danzig, Lübeck and Nürnberg. When in a group of buildings, the lining private buildings are supported by a suitable structure of prominence as a focal objective, a pleasing street picture results. But, can the charm of these old street pictures be completely reproduced? By no means, as the mellowing effects of generations of time are altogether missing.

"When, however, the monotony of the enormously long straight streets of modern cities has to be endured, with

Saint Michel Fountain, Paris

Flatiron Building, New York

TRIANGULAR BLOCK TREATMENT

WEYBOSSET ST., PROVIDENCE, R. I.
Comfort station with ventilating tower

their interminable lines of similar structures, the artistic principles upon which the old cities were founded should be remembered.

"Much more important is the difference in the direction and width of the streets, which existed at that time and those of to-day. There were then many narrow streets, with numerous turns and deflections, and seldom any straight building line of any considerable length, the houses or groups of houses often projecting beyond or standing back from the building line, while the width of the streets was constantly changing and their axes interrupted by monuments and fountains. To-day the width is unchanging, and there are straight building lines, hours long. In those days the principles of variety and unsymmetry produced pleasing artistic effects, but to-day the best that can be done is to produce bald effects of massive proportions.

"Nevertheless, the straight street is unsuited to a rolling or hilly configuration of the land, and although a city street may be built in a more direct fashion than may a country road, it is nevertheless the part of wisdom not to attempt to overcome the too reckless works of nature.

"While it can by no means be recommended that the Building departments should be so careless as to permit buildings to disregard the building line, or to adopt the principle of the bent streets in defiance of the necessities of traffic, there are still, however, many principles then followed which, in the new city planning, could be employed with great advantage in producing architectural effects.

"Thus in cities in which there is already a core, as was the case in most of the old cities, the radial system of streets is to-day, as it was then, one which with advantage may be adopted. From a city, when neither natural or artificial obstacles prevent, in order to reach and develop industrial and commercial enterprises and to communicate with other places, streets and roads will of their own accord take radial form, reaching in every direction. Such radial tendencies show the natural direction of traffic between city and country and for that reason, even to the smallest foot-

way over the fields, they must be attended, as often the by-path of to-day becomes the road of the future.

"When a city has, through the provision of open spaces, performed that part of its duty in promoting the health of its public, it should still further see that such spaces are suitably provided with trees and vegetation, for the good influence thereby exerted has long been physiologically

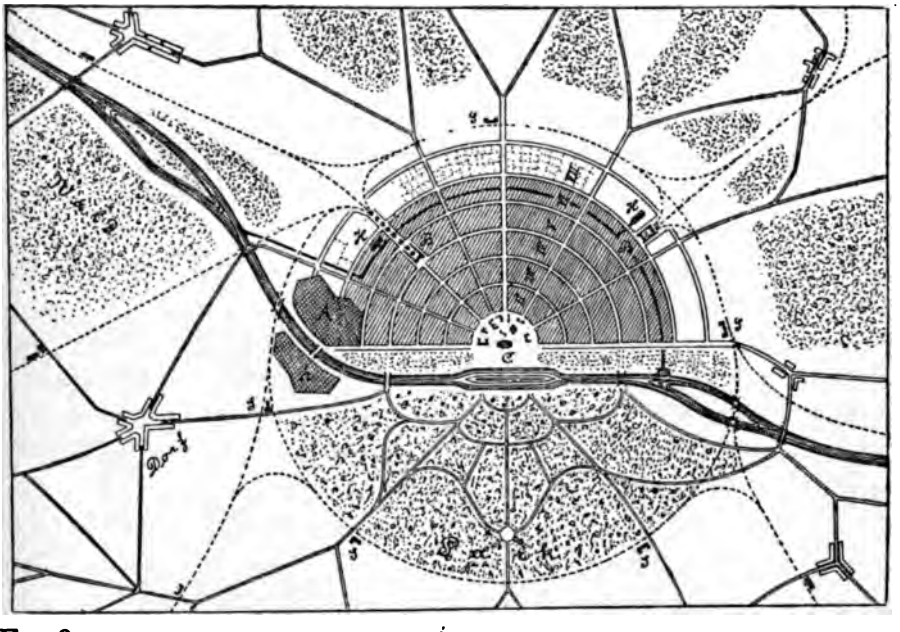


FIG. 9. PLAN OF A CITY WITH RADIAL AND CIRCUMFERENTIAL AVENUES

A–A, Existing City; B–B, Railroad Stations; H–H, Canal Harbors; S–S–S–S, Belt Railway Stations.

recognized. But of greater importance is the spiritual stirring produced, especially in the German peoples, the result of the communion of humanity with nature. The poetry of the forest, the enjoyment of walking and the observation of nature and the innocent play of children with animals are all evidences of this feeling.

"In our modern cities, with their unbounded expansion and with the plants of industry and traffic located over a wide radius, there is a tendency for business life to concentrate in the heart of the city, and at the same time for

homes to locate in the quietness of the country. It is important, therefore, in the establishment of such pleasurable places of residence, in the course of city improvement, in order that the needs of the body and the soul be met, that the housing question be carefully considered. The provision of facilities of such a character is a duty that the city owes to its public, especially the middle and poorer classes, but of importance to all.

"In the city itself, and especially in the city of the future, vegetation is particularly desirable to quiet the nerves in the disturbing influence of noise and bustle, to revive the spirits after exhausting labor and to restore the temper.

"Closely connected therewith, the æsthetic relation of architecture and vegetation must not be forgotten. In a great city, the surface of the earth should nowhere be left bare, but should always be treated in a naturalistic spirit. By means of trees, decorative gardens and grass plots, the effect of buildings can be greatly improved and embellished. Such elements may be employed most effectively when used to surround architectural groups with borders, backgrounds and in the spaces of vistas.

"In addition to the public parks, cemeteries and woodlands requisite, are the numerous decorative parks, for which the public is largely indebted to the enterprise of earlier and ruling princes, but which, nevertheless, seem in no city to be sufficiently numerous, and it is to be urgently recommended that more should be provided, or at least the land therefor acquired before the opportunity is lost through the progress of building operations."

The principles upon which Baumeister based his work have proven to be sound and of great practical value, not only in the beautification of cities, but in the solution of the interlocking social, industrial and commercial problems.

Some of the accompanying illustrations are of the ground plans of cities which have been planned to include the highly important elements pointed out, those of variety and individuality.

Very excellent examples are seen in the cities of Moscow and Karlsruhe. The street plan of Constantinople is peculiar in that there are a great number of curved streets. The city of Nancy is known as a city of great individuality, as will be evidenced by the plan. The city of Mannheim is peculiar in that though the principal portion of the city is of the gridiron plan, it is relieved by a large horseshoe. Many American cities may find in this treatment, the cue for a proper remodelling of their interminable gridirons.

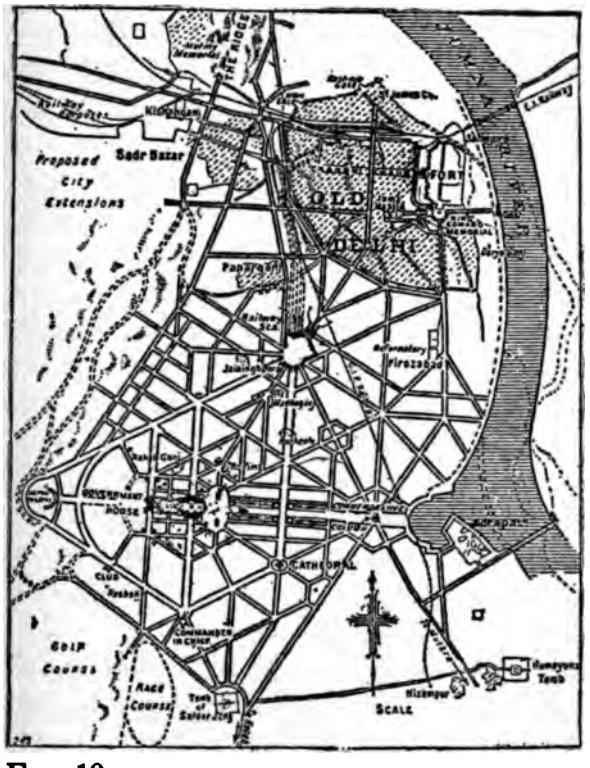


FIG. 10. GREAT GROUND PLAN OF THE NEW DELHI, THE CAPITAL CITY OF INDIA
The construction was begun at the Durbar.

It is the general impression that Washington is one of the best laid out cities in the United States, and the accompanying illustration shows its great ground plan. It will be seen that the plan consists of a gridiron, through which are run a system of diagonal avenues. While Washington is undoubtedly one of the best planned cities in America, it only partially exemplifies what are to-day recognized as the best principles of city planning. The plan of Washington is such that it shows its great monumental structures to good advantage, but otherwise, with the exception of the squares produced by the intersections of the straight diagonals with the gridiron streets, it is lacking in variety and interest, and has all the monotony of long streets.

Much the same objection may be made to some of the principal streets of Paris, which are not sufficiently demarked to produce a proper degree of individuality.

In 1902 a Committee of the Senate made an elaborate report on the improvement of Washington, which indicates, at least, that such an improvement is considered desirable.

The great ground plan of Buffalo excels that of Washington, and is notable among the city plans of the cities of the United States. It was early realized that a great city would develop in the vicinity of Niagara, and proceeding on this conviction, the site of Buffalo was the result of a sagaciously made selection. It is located where it is, not as an accident of growth, but in pursuance of a carefully considered plan. Joseph Ellicott, an agent of the Holland Land Company, laid out the city in 1801–02, calling it New Amsterdam. Ellicott is known as the "Father of Buffalo" and the city owes him a debt of gratitude of far greater proportions than is generally realized, for while other cities are spending great sums in reconstructing their street plans, Buffalo enjoys the great heritage of a well-conceived and well-executed plan, the fruit of his genius and foresight.

Joseph Ellicott was a younger brother of Andrew Ellicott, the first surveyor-general of the United States, and the man who completed the city of Washington on the designs of the great French city planner, L'Enfant. The younger brother, himself, did considerable work on Washington, and when he came to plan Buffalo, he knew the true theories and laid out the city accordingly.

After him the art of city planning in America seems to have died, for with the exception of Washington and Buffalo, American cities are almost wholly built at haphazard. As the result, however, of a recently awakened interest, millions in money are being spent by cities throughout the country in remodelling their streets. Buffalo, with her plan, is saved such necessity and may thus devote to other purposes sums which would have had to be spent in reconstruction but for the work of Ellicott.

As has been indicated, in order to hold the development

of a city to its plan, stringent regulations must be put in force. Washington, for example, has not developed as was

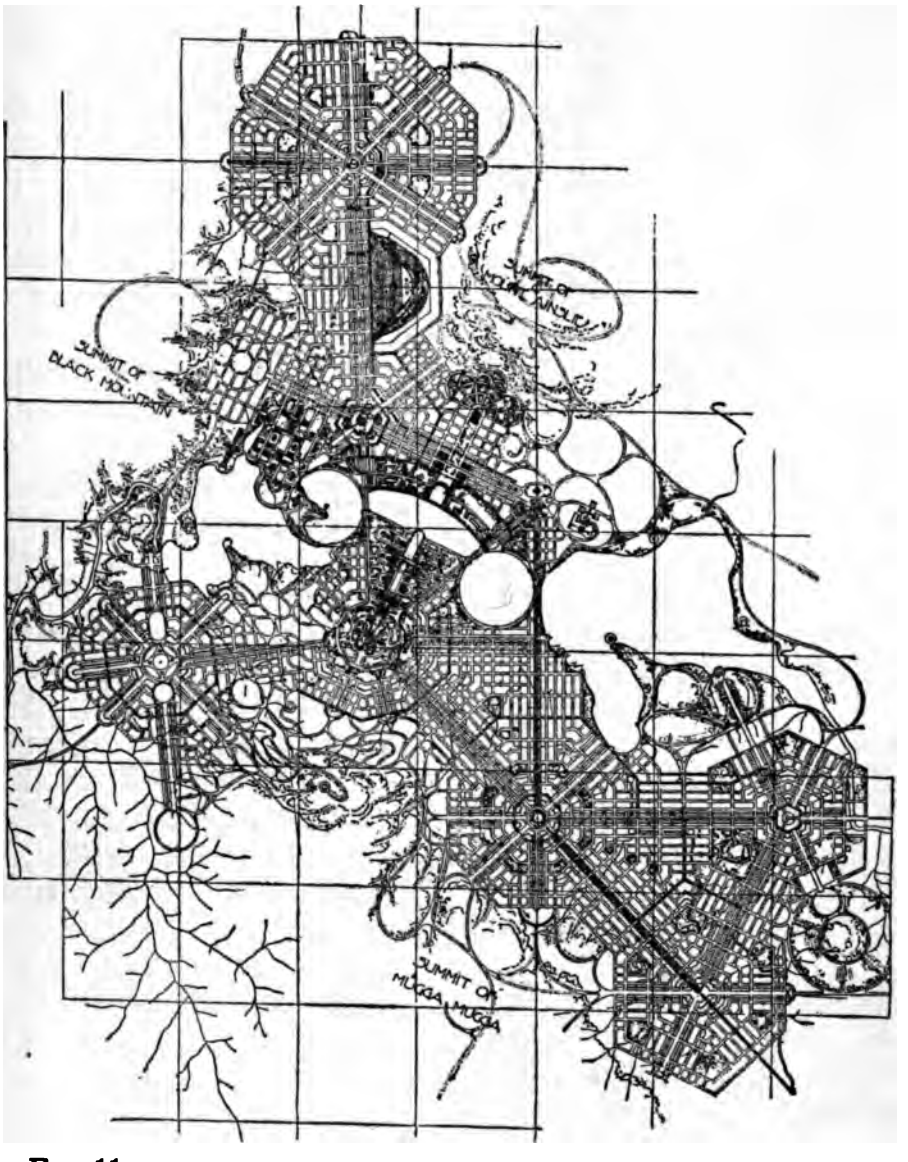


FIG. 11. GREAT GROUND PLAN OF CARBERRA, THE PROPOSED NEW CAPITAL CITY OF AUSTRALIA

the intention of its planners, and no city will, unless properly compelled to. While numerous objections are likely

PROPOSED CITY HALL PLAZA, PHILADELPHIA
Palace of Justice in center, City Hall at the right

PROPOSED REARRANGEMENT OF WATERWAYS, CHICAGO
***Handling freight** and traffic on different levels as in Düsseldorf, Algiers, Buda-Pest, Geneva and Paris*

PRINCES STREET, EDINBURGH

A striking example of a formal plaza

to be raised to the enforcement of such regulations, they will be trivial beside the benefits to be gained. Such objections prove of little weight when regulations are put in practice, for far more drastic ones are constantly being carried out.

For example, in New York, in the case of Fifth Avenue and Riverside Drive, and in similar streets in other cities, heavy traffic and push-cart peddling is prohibited. On West End Avenue, business and traffic are halted at 70th Street, and above that point a most remarkable transformation occurs. It is as though a Chinese wall had been erected, for to the southward, where the thoroughfare is called Eleventh Avenue, are tenements and factories, railroad yards, slaughter houses and storage yards of the most unsightly character, it being the base of the San Juan Hill section, inhabited by negroes. Above the dividing line, however, is one of the finest and quietest residential districts of the city, the houses being surrounded by lawns, a most unusual circumstance on Manhattan Island. No more striking effect of regulation could be found than at this point.

It always works out that the stricter the regulations, the greater will be the degree of real personal liberty enjoyed by the whole public, for lack of regulation, with consequent private license, is always destructive of the interests of all except those who wish to encroach upon the rights of others.

In fact, the desirability of building regulation is always so great, that it is often carried out by private initiative, as for example in the suburbs of American cities in which the land is sold with certain restrictions as to the minimum cost of the buildings to be erected. Often, also, there is a prohibition of the use of property for certain purposes, such as for the sale of intoxicants and the like.

There are, in fact, a far greater number of regulations in effect than is generally recalled. In many cities saloons are forbidden in certain neighborhoods and within certain distances of schools or churches, while the social evil has often been confined to a certain district or districts, as in

Washington, where a large section near the White House has until very recently been devoted to it, and in Baltimore, where a number of small sections were set apart. Traffic is also forbidden in hospital streets and on school streets during the hours children are going to and from school. Smoke nuisances are prohibited and various kinds of noises are illegal. In some cities, already, the height of buildings is controlled, as will be indicated later, and more and more are we coming to realize that true freedom is found in proper regulation.

CHAPTER V

ARTERIAL HIGHWAYS

Arrangement of Highways; Width of Streets; Cutting New Streets

In considering the various problems of traffic to be solved, the principles of city planning, as have been indicated, should guide the work. The purpose of the city should be kept in view and carried out in the best possible manner.

A city is in reality a kind of apparatus or mechanism consisting of fixed places in which to live, work and be amused, with means of access thereto and means of transportation of products to and from desired points.

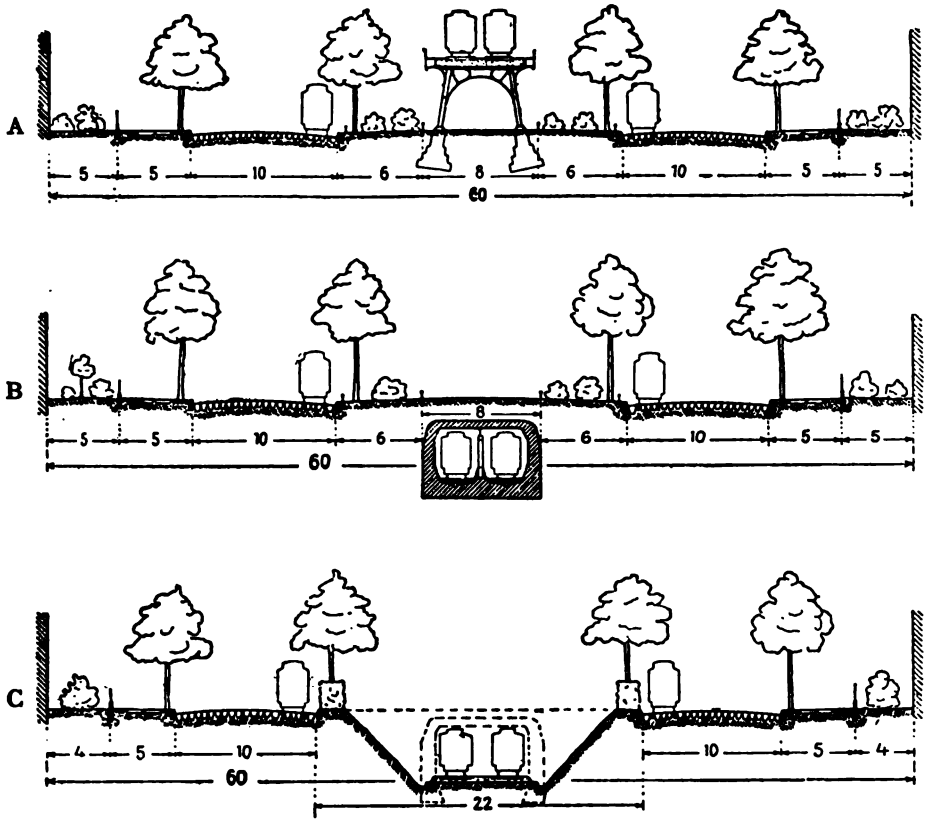
The first duty of the city is to furnish a free means of access, belonging to the public, to the private property of each individual. Such avenues of communication in the rural districts are called roads, and are widely separated, but in cities they are multiplied and called streets. It must always be possible, and it is possible, for a citizen to take to the highways and reach, without interference, the land of any other citizen throughout the United States.

In a city, the arrangement of highways must be such that the citizens who traverse them in great numbers may be enabled to reach their destinations with the greatest possible despatch, for a large part of the time of the public is consumed in merely going from place to place. The daily movements of the population should thus be studied with the utmost thoroughness and the streets laid out so that access to the different parts of the city may be had from all the other parts in the most direct manner possible.

A question of great importance to the civic engineer in the laying out of such a plan is that of grades, as many

cities are built on hills of greater or less height, and the arrangement of streets and avenues must be such as to overcome in the most effective manner such natural obstacles.

One of the best methods of laying out a city, as has been



FIGS. 12, 13, AND 14. CROSS SECTIONS OF PROPOSED ARTERIAL STREETS, BERLIN

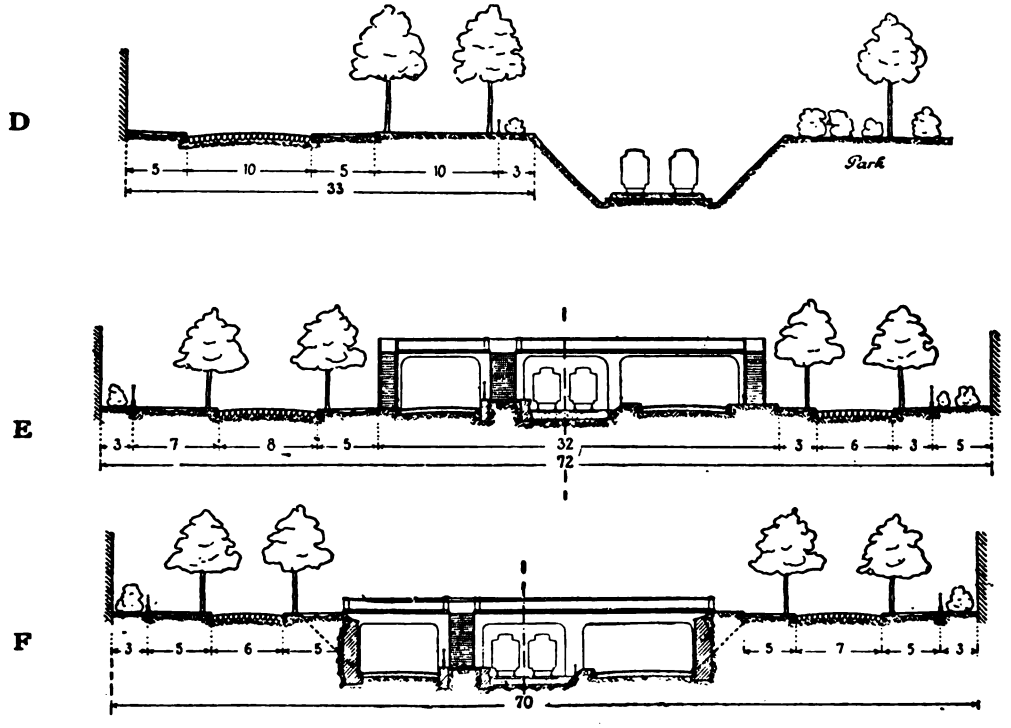
A, Elevated and Street Railway; B, Subway and Street Railway; C, Sunken Rapid Transit and Street Railway. The Figures are in meters (1 meter equals 3.28 feet); the Streets are 196.8 feet wide.

pointed out, is that of radial streets leading to the principal center, with circumferential concentric streets, but sufficient variety must enter into such a layout to obviate its faults.

The principal stream of passenger traffic during the day is between the better residential districts and the civic and office building districts, between the homes of work-

men and factory districts, between both the residential districts and homes of workmen and the retail districts, and in the evening between the various residential districts and places of amusement and recreation.

Radial avenues leading thus to the civic center, adjoining which may be placed the retail district, and similar



FIGS. 15, 16 AND 17. CROSS SECTION OF PROPOSED ARTERIAL STREETS, BERLIN

D, Sunken Street Railway; E, Rapid Transit Railway between two Automobile Roads with elevated overhead Passageway for Pedestrians; F, Rapid Transit Railway between two Automobile Roads with overhead Street Crossings. The Figures are in meters (1 meter equals 3.28 feet).

important avenues into the shipping and manufacturing districts will take care of the main passenger and pedestrian traffic during the day, while at night the amusement center is ordinarily reached over the same lines of traffic, since it is usually found between the retail and the residential districts.

There is no great need for important streets between the various residential districts of a city, as the traffic between them is light. Through such districts, however, a driveway or boulevard may be run. A pleasing drive is thus afforded, which adds greatly to the attractiveness of the city.

In order to afford ample facilities for traffic and at the same time to avoid unnecessary outlays, streets in varying widths should be provided. It will usually be found that streets of three different widths will suffice for practically all purposes; that is to say, main thoroughfares, secondary thoroughfares and local streets.

As a rule, it is better to err on the side of having streets too wide than too narrow. A city should have as a minimum, 20 per cent of its area devoted to streets, while 40 per cent is a far better allowance. The streets of the city of Washington, which are unusually wide and imposing, occupy 54 per cent of the city's total area.

A Prussian law of 1875, enacted to cover the streets of Berlin, prescribed that the main streets should be 95 feet or more in width, secondary thoroughfares from 65 to 95 feet and the local streets from 40 to 65 feet. Another standard for secondary German cities, such as Düsseldorf, Cologne and Frankfort, etc., is: main thoroughfares, 85 to 120 feet, secondary thoroughfares, 50 to 80 feet and local streets, 35 to 48 feet.

The Royal Commission on London Traffic in the report of 1905, states:

"The chief difficulty that stands in the way of improving the means of locomotion in London is the narrowness of the streets, and the fact that they were not originally laid out on any general plan."

The Commission recommended the following widths: main avenues, 140 feet; first-class arterial streets, 100 feet; second-class arterial streets, 80 feet; third class, 60 feet, and fourth class, 40 to 50 feet, the width in each case to include the footways on either side, and no street to be less than 40 feet in width.

TRAFALGAR SQUARE AND WESTMINSTER ABBEY

Picturesque views in London

MARKET PLAZA, WIESBADEN

Open marketing place during market hours, showing entrance to storage cellar, ventilating column and balustrades

The widths of the more prominent avenues in European cities are as follows:

Avenue des Champs Elysees, Paris	250 feet
Reeperbahn, Hamburg	210 "
Unter den Linden, Berlin	190 "
Ring-Strasse, Vienna	185 "
Belle Alliance Strasse, Berlin	160 "
Andrassy, Buda-Pest	145 "
Avenue Henri Martin, Paris	130 "
Whitehall, London	120–145 "
Victoria Embankment, London	120 "
Potsdamer Strasse, Berlin	110 "
Friedrich Wilhelm Strasse, Berlin	110 "
Princes Street, Edinburgh	100 "
George Street, Edinburgh	100 "
Avenue de l'Opera, Paris	98 "
Parisian Boulevards, Paris	98 "
Holborn Viaduct, London	90 "
Regent Street Quadrant, London	85 "
Piccadilly, London	75 "
Queen Victoria Street, London	70 "

The first consideration in determining the width of streets should be the volume of traffic which they will be called upon to accommodate. After making allowance for street car lines, of some twenty feet for a double track system, the next consideration is whether the street is to be wide enough for one line of vehicles on each side of the car tracks or more than one. All streets, however, on which car lines are run, should be of such width that a delivery wagon may be backed up to the curb and room still be left, when the horse is turned parallel with the street, for the street car to pass. In figuring the width of the street necessary to accommodate two lines of vehicles on either side of the car track, allowance should be made of from seven to nine feet per line of vehicles, depending on the nature of the vehicular traffic, the figure of nine feet being for the purpose of accommodating the large motor trucks which are coming into use in many cities.

The width of sidewalks is generally placed at one-third of the width of the whole street, that is, one-sixth on either

side, though it may be greater when pedestrian traffic is above the normal.

Mr. John Nolen in a paper read before the Third National conference on City Planning, at Philadelphia, May 17, 1911, gave a table showing how the widths of streets from 48 to 108 feet is made up.

MAIN THOROUGHFARE

A double-track car line	20 feet
6 lines of vehicles, 3 on each side of tracks, 8 feet each	48 "
20 lines of pedestrians, 10 lines on each of the two sidewalks, 2 feet each	40 "
Total	108 feet

SECONDARY THOROUGHFARE

A double-track car line	20 feet
4 lines of vehicles, 2 on each side of tracks, 8 feet each	32 "
16 lines of pedestrians, 8 lines on each of the two sidewalks, 2 feet each	32 "
Total	84 feet

LOCAL STREETS

Roadway of 3 lines of vehicles, 8 feet each	24 feet
12 lines of pedestrians, 6 lines on each of the two sidewalks, 2 feet each	24 "
Total	48 feet

That streets should be of ample width cannot too often be insisted. It is, indeed, one of the cardinal principles of modern city planning. In Berlin, where street widening is constantly being carried on and new streets constructed, a great deal of attention is given to the subject.

A competition was recently held in which large prizes were offered for the best projects for improving and enlarging the city's plan. The first prize was won by Prof. Joseph Brix and Prof. Felix Genzmer in collaboration.

The diagrams Figs. 12 to 17 illustrate some of the forms of street construction proposed by them.

FIGS. 18 AND 19. REPLANNING OF SEVERAL MAIN STREET ARTERIES IN FRANKFORT ON THE MAIN

The upper figure shows the original and the lower the new Street Plan

Diagrams A, B and C are laid out for streets having a width of 60 meters (186.8 feet). It will be seen that the first contains an elevated road, the second a subway and the third a depressed railroad in an open trench with culverts at cross streets. A surface car line is on each side of the rapid transit road. Between the sidewalk and the building line, a space is left for grass and shrubbery.

Diagrams E and F show much wider streets, E being 72 meters (236.1 feet) and F, 70 meters (229.6 feet).

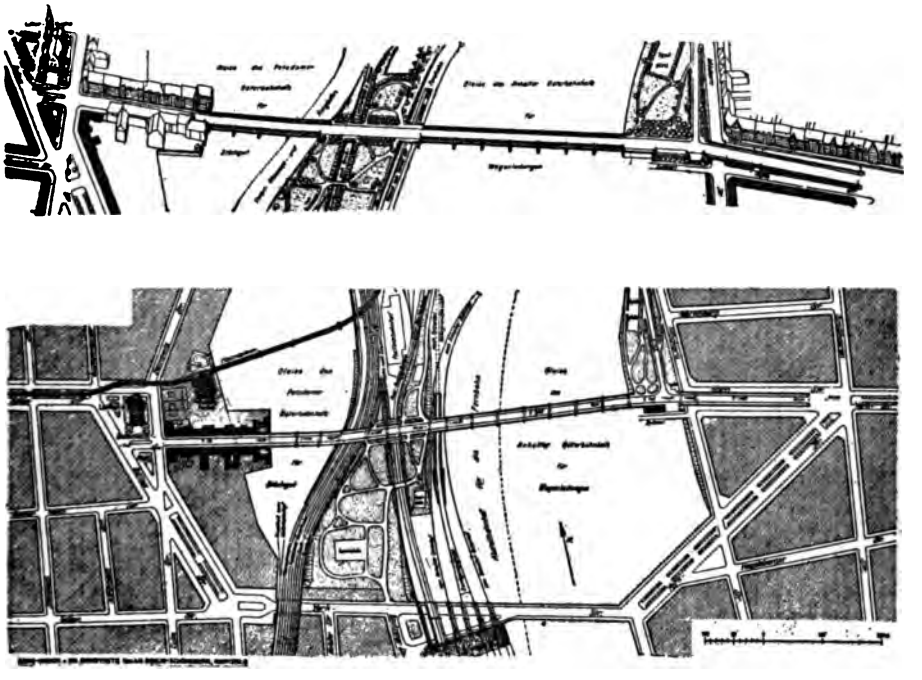
Plans similar to E and F have also been prepared for Paris by the French engineer Frank. Plan E is a kind of overland street or motor parkway for high speed electric traction and automobiles. At certain intervals the motor and traction lines of the street may be crossed on superstructures which afford access to the stations of the express lines.

In diagram F, the superstructure is replaced by a bridge, the motor and traction lines being depressed in an open trench, with retaining walls. On a street having a width of forty feet more, slopes may be substituted for the retaining walls, as indicated by the dotted lines.

Boulevards should always be limited in some manner in length, if not by terminals, then by changes in direction, since too long a stretch of straight street degenerates into a blurred and characterless horizon, monotonous and uninteresting.

Streets and avenues too long and too straight are an evil, as has been pointed out, suffered even by cities famous for their city planning. Paris, for example, has too many streets with vistas dwindling into nothingness. The world-famous Champs Elysees is of such a character. New York is almost wholly composed of such streets. Broadway from Bowling Green to Grace Church is an uninterrupted line, while even longer stretches characterize the street, which extends through a number of towns to the north, continuing to bear the name of Broadway. Fifth Avenue and other New York streets, in fact streets in almost all American cities, are ruined by their inordinate lengths in straight lines.

The principle of variety, one of the cardinal principles of design, is thus disregarded. In the modern science of city planning, streets should be of definite lengths, properly terminated, or curved or changed otherwise in direction, and by no means necessarily of the same width throughout. The eye should rest at easy distances upon columns, arches,



FIGS. 20 AND 20*a*. PLAN AND PERSPECTIVE VIEW OF STREET AND BRIDGE APPROACHES AT FREIGHT YARD AND RAILROAD TERMINALS, BERLIN

statues, fountains, façades or other suitable objectives, and the quality of unity thus be gained. Without a terminal, a vista is meaningless. What, for example, would the Avenue de l'Opera be without the closure of the Grand Opera House, Rue Royale without the Madelaine, Avenue Victoria without the Hôtel de Ville, the Vienna Burgring without the Parliament building, the Reichrathsstrasse without the Votiv Kirke and Unter den Linden without the Brandenburg Tor?

An interesting feature of modern city planning abroad is the constantly progressing reorganization of focal points.

Thus where a number of streets join, a study is made of the conditions, and the juncture, if necessary, entirely replatted and a suitable structure erected in such a position as to be seen to the best effect on the axis, or main street leading to it. In this way, the center is unified and given a new individuality.

In the undertakings of city planning, foreign cities do not hesitate at expense. Paris has spent $265,000,000 on its reconstruction. London in new streets has spent $100,000,000 and the new Commission has under way expenditures which will amount to $125,000,000 more. Berlin is expending $80,000,000.

That expenditures for the betterment of traffic conditions are justified is shown by a calculation made with reference to an improvement in a portion of St. Louis, the cutting through of Gravois Avenue to 13th Street, a short stretch of three blocks. It is estimated that the saving in time to those using the cut-off would amount to $500,000 a year. The calculation is on the following basis: The saving would amount to ten minutes a day each way for every person travelling over the road. In a year this would total 100 hours, which at 20 cents an hour means a saving of $20 a year, per person, or for a traffic of 25,000 daily, but one twenty-eighth of the city's population, the aggregate of $500,000 per annum.

This is merely for a small improvement in a city of no great size and in a section by no means crowded. What such savings mean in more congested districts of the greater cities may readily be understood.

An important improvement of this character recently proposed, is that of a diagonal street from the Pennsylvania Terminal at 7th Avenue and 32d Street, New York, to the Grand Central Terminal at Fourth Avenue and 42d Street. Such a new avenue would intersect Broadway at 37th Street and reach 5th Avenue at 40th Street at the corner of the new Library, 40th Street then being widened to Park or Fourth Avenue to join the approach to the Grand Central Depot at 42d Street.

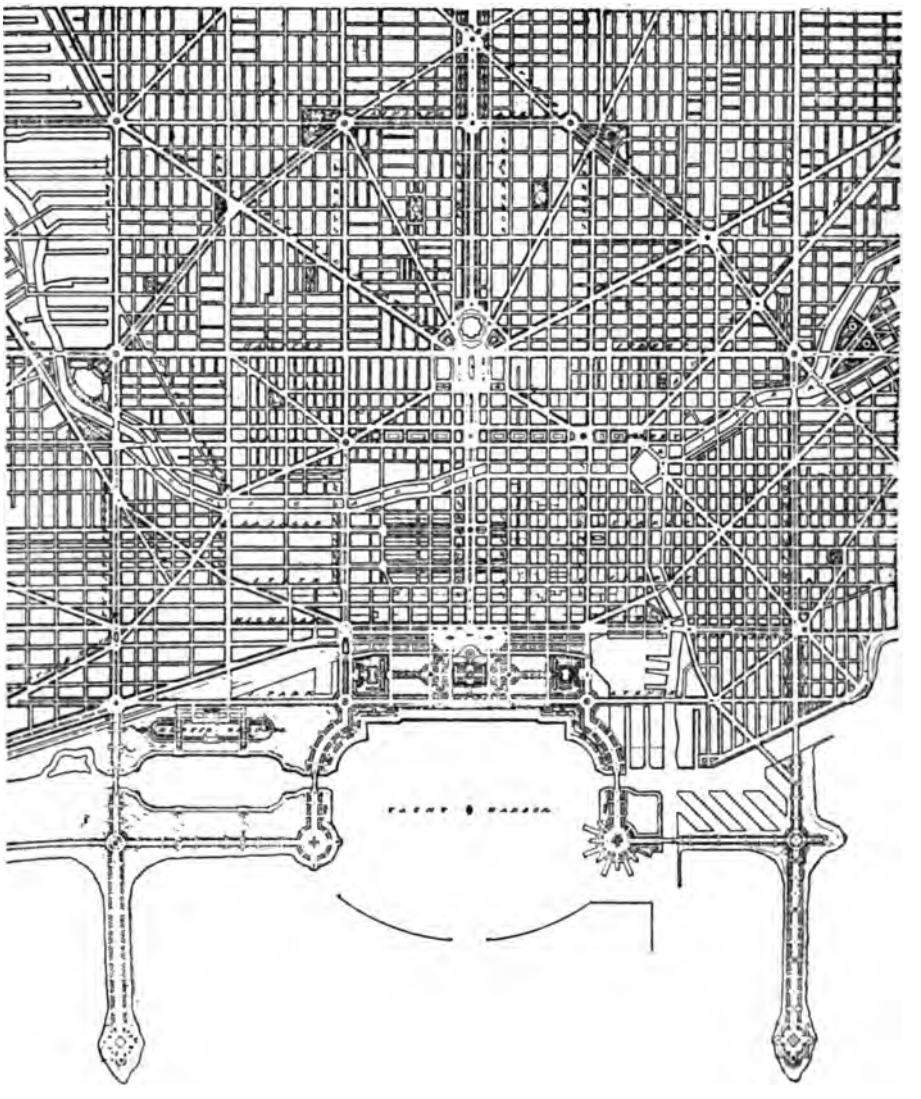


FIG. 21. PROPOSED MODIFIED GREAT GROUND PLAN OF CHICAGO

Showing Arterial Highways, Civic Center, Railway Stations, Yacht Harbor, Pleasure Boat Piers and Parks. (*Copyrighted by the Commercial Club.*)

In reference to the London improvements, large numbers of British officials have visited Germany and other continental countries in recent years, to familiarize themselves with modern city planning. A hundred foot street from High Holborn Street southward, terminating in a crescent opening on the Strand at a point opposite Wellington Street and towards Fleet Street, is one of the more important of the resulting projects. Another is King Edward Square, reaching from Whitehall Street into St. James Park.

The present, it will thus be seen, is a time of renaissance in city planning, if not an entirely new era, and the greatest of results are being and will continue to be accomplished.

CHAPTER VI

STREETS UP-TO-DATE

Appearance of Streets; General Service Tunnel and Pipe Galleries; Street Fixtures; Safety Isles; Sidewalks; Police and Fire Alarm Systems; Shade Trees

THE appearance of a city and the impression which visitors as well as residents receive, is dependent far more than is popularly supposed, upon the appearance of the street itself, that is the street surface, as considered apart from the buildings.

In order that streets may have the best possible appearance, they should be constructed by competent and experienced engineers, and when in use, must not be allowed to deteriorate. Repairs should be made at the slightest sign of a break. If the repairs are neglected, the breaks become rapidly larger, with a consequent quickly mounting increase in the cost of making the street good again, while during the time the breaks exist, the appearance of the street is spoiled and, unless the breaks are thoroughly repaired, its appearance is never as good as before.

The point of view of the average American toward the streets is largely responsible for the bad conditions which almost invariably prevail. The American seems to regard streets as a sort of necessary evil, and their repair as a more or less superfluous expense. He seems to feel that as only one vehicle at a time passes over a hole, a little care on the part of the driver would save the city the expense of the repairs.

Nevertheless, no expense that a city can go to is much better repaid than that of keeping the streets in a thorough condition of repair. With good streets, drivers make much

better speed, greater loads may be carried, and the wear and tear on the vehicles is greatly reduced. Accidents and breakdowns are obviated, with consequent saving of expense to vehicle owners, and the streets are much more readily kept in a clean and sanitary condition.

Americans have in reality little or no conception of the condition in which a street should be maintained until they have seen the remarkable smooth and clean streets of European cities. Their excellence, which might easily be rivalled by American streets, is due to the thorough methods of construction, and the high degree of engineering skill retained.

One of the unmitigated evils suffered is the constant tearing up of streets for the purposes of laying pipes of various kinds. In streets properly designed, the piping systems for gas and water, and conduits for electric cables should be provided in ample capacity, with a sufficient number of side outlets to take care of future connections.

In large cities it is advisable to have tunnels, which may be arranged to contain all the water, gas and steam piping, pneumatic postal tubes, lighting, power, fire and police and telephone cables, and also, beneath the floor of the tunnel, a sewer. Such a general service tunnel, while expensive in first cost, amply repays the city as well as the abutting property. No work of any character should be performed on public territory except by special permission from the building departments. This should apply equally to public-service corporations, operating gas works, electric light and power works, street railways, and elevated and underground railways. When it becomes necessary to repair underground works or to make additions thereto, or to erect fences or scaffolding, the building department should issue the necessary permit but should reserve the right to restore the street and sidewalk pavements to their original condition, and the owner of the property involved should be taxed the total cost of effecting these repairs.

Gas and electric connections should always be made by the companies themselves, the cost thereof being charged to the owners of the property involved. Private electricians

TAUENTZIEN STREET, BERLIN

Showing central promenade lined by flower beds, outer roadways, uniform height of buildings and church as a focal point

CHARLES GATE, MUNICH

A semi-circular public square, with parking for automobiles and cabs on either side and waiting station for street cars

GAIETY THEATRE, LONDON

ST. PETER'S AT ROME

Domination of important squares by public buildings

and plumbers should never be authorized to tear up the streets for the purpose of making gas or light connections.

In order that the derangement of traffic and annoyance involved in building operations upon the streets may be reduced as much as possible, the plan adopted in Hamburg is found to be a good one. An annual meeting is held which is called by the director of underground works, who is the chief of the central bureau of the engineering department. These meetings are attended by eight members and one secretary of the public building departments, four members of the street railway companies, and one representative each of the electric lighting and power company, the gas company, the water works, the traffic police departments, the fire department and the telephone and telegraph department.

The program is prepared in advance for these meetings, containing several hundred different items, nearly all of which relate to the repair of street pavements. The program is sent out in advance to various persons who attend the meeting and during the discussion thereof arrangements are made to have all necessary work in a given locality performed at the same time, as far as possible. These annual meetings have proved to be extremely useful not only in reducing the cost of effecting changes, but in minimizing inconvenience to the public. A further reference to the subject will be made in a later chapter.

As a general rule, the surfacing of American streets is without adequate foundation, and the curvature is too slight, which allows water to remain and evaporate, instead of running off quickly.

One of the greatest defects of American streets consists in their being defaced by a multitude of minor obstructions, extending from half an inch to one or two inches above the surface, such, for example, as the extremely numerous and poorly fitted manhole covers of sewer and electric cable pits and underground trolley channels; protruding gas and water valve caps, and the poor junctures of the street railway rails with the street surfacing.

The smooth surface of the street is thus entirely de-

stroyed, the cost of cleaning and flushing increased, and danger and interruption to traffic and wear and tear on vehicles greatly augmented.

The discharge openings of the gutters to the sewer pits are badly constructed, and unsightly and dangerous in the extreme. The holes are so large that it not infrequently happens that children fall into them and are drowned. Such openings need not be placed exactly at the corner, and the street immediately before them need not be sunk so sharply, but instead, an easier grade should be provided, and the openings protected by well-designed gratings with a clearance between bars of not more than one and one-half inches.

It is advisable in the streets most used for promenading to have iron or steel gutter covers at crossings, the width of the sidewalks, both for the main street and for the side street, thus affording a smooth promenade from block to block and saving the necessity of stepping down into the streets and out again at every crossing.

What has been said with reference to the appearance of the streets is equally applicable to the appearance of the sidewalks.

It is even more important that they should be as smooth as possible, and entirely free from obstructions of every character.

City officials of some American cities are following the example of those of European cities in this respect, and improvements are gradually being effected.

Regulations of the following nature are in force in many European cities, and while some of them may appear radical to those unfamiliar with the question, they have all proven in practice to be of the greatest utility.

Curb-stones should not be more than six or eight inches above the abutting roadway.

The corners of the sidewalk should have an easy radius, of not less than six feet.

The sidewalk should have a gradual slope towards the street, and should be as smooth and uniform in material as possible.

Manhole covers in the sidewalk should be exactly flush with the sidewalks at their edges, and should not rise more than half an inch at their centers. They should be entirely free from spikes, rivet heads and sharp corrugations, and if there are corrugations and projecting points, their upper surface must be not less than one-third of the total area of the cover.

No open gratings whatsoever to be allowed, either for purposes of lighting or ventilation. This regulation should

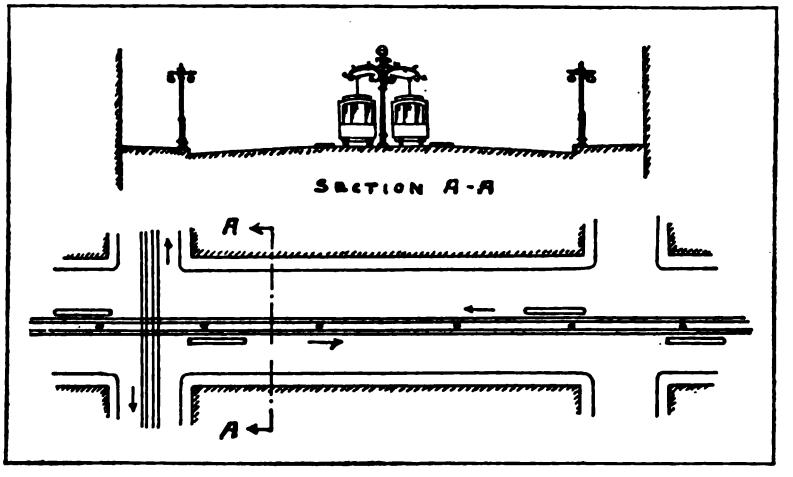


FIG. 22. METHOD OF ARRANGING OVERHEAD TROLLEY SYSTEM AND SAFETY ISLES AS FOLLOWED IN MANY EUROPEAN CITIES

be enforced against municipal subways as well as against private owners. Its necessity cannot be too strongly emphasized, because there is a growing tendency to discharge foul and hot air, dust, odors, etc., into the faces of pedestrians, a practice that is peculiarly disagreeable to women, and one which would not be tolerated half an hour in any German town. Neither should such gases and foul air be discharged from openings in the walls of the building towards the sidewalk. The only proper method of such discharge is through shafts or chimney to the roof and carried up a suitable height.

No steps leading either upward or downward from the sidewalk should be permitted outside the building line, and no railings of any kind should be permitted on the street.

No show-cases or obstructions of any kind should be permitted on the sidewalk.

No window exhibits or demonstrations should be permitted of such a character as to collect crowds of curiosity seekers in the street and thus obstruct traffic.

No elevators from basements should be permitted to open on the sidewalks, but should open in recesses in the sides of the building.

The placing of temporary bridging or planking from trucks in the street, across the sidewalk to the building should be prohibited. This is an abuse that is particularly practiced in American cities, and pedestrians must constantly take to the streets to get around these wagons. Tenants of such buildings have not the slightest right to block the streets in such a way, and it amounts to a serious inconvenience and imposition upon the users of the sidewalk. It should be obviated by constructing recesses in the building into which the trucks could be backed for unloading, or by the use of interior wagonways, courts or yards. The sidewalk at the point of entrance of such wagonways should not be depressed at the curb, but removable cast iron or steel gutter plates should be provided to enable the trucks to get in from the street.

The use of the streets for loading and unloading mail wagons also proves a serious nuisance. The Government has no right whatsoever, in the conduct of its operations, to obstruct the public highways in such a manner, any more than has the business man. The Government, indeed, sets a bad example and is the more reprehensible. Mail should be loaded and unloaded in courts.

Express companies are old offenders in the use of the sidewalks as freight sorting stations, but in certain cities they have been compelled to adopt the plan of courts and interior wagonways.

In the construction of new buildings the use of the sidewalk should be preserved to the public for at least half of its width, and for the remainder, which is occupied by the builders, a rental should be paid to the city. A further

Double arm arc lamp pole, Berlin

Trolley and electric light poles, Cologne

Single arm arc lamp pole, Düsseldorf

EXAMPLES OF STREET EMBELLISHMENT BY PUBLIC SERVICE COMPANIES

Berlin news stand with municipal clock, and mosaic promenade

Three-dial clock. Its column is used for advertisements, the interior being filled with electric transformers and switches, police alarm system, etc.

Artistically designed four dial municipal clock

EMBELLISHMENT OF STREETS BY MUNICIPAL CLOCKS

rental should be paid to the city for the storage of building materials in the streets, such as sand, stone, etc., and for the use of the streets for mortar beds and hoisting engines.

When platforms over sidewalks are required, they should in no case be higher than three steps, or two feet above the sidewalk level, while the rental for the second and third steps should be progressively higher. In large cities especially, the continual erection of new buildings proves a source of the greatest inconvenience to the public, and renders the streets unsightly and dangerous. It is customary to erect a heavy bridge over the sidewalk, along the frontage, and this remains a fixture for from three to six months or more. As soon as it is removed, another appears somewhere in the neighborhood, and a chronic condition of disturbance is the result. Such temporary structures may with little expense be made of a decorative nature, instead of being left spots of ugliness. The timbers should be dressed and painted, and corners fitted in a neat manner, the roof tight and the whole finished with latticework painted green, or some other such decorative treatment given. Large advertisements should not be permitted, but a small one, stating the name of the architect, the contractor, and the name of the building or purpose for which it is to be occupied, may be permitted. Such a plan of treatment has great advertising value and disposes the public favorably to the whole undertaking. It is a paying proposition. At the suggestion of the Municipal Art Commission, it is being voluntarily adopted to a considerable extent in New York City. It should, however, be a matter of law, as the unsightliness of building operations is a nuisance to the public and a distinct loss to the merchants of the neighborhood. During such operation, certain classes of building materials stored and in use and rubbish being removed should be wetted down to prevent dust.

Space under the sidewalks should not be given over to private uses.

Fire hydrants, especially in prominent streets, if not placed against the building wall, should be sunk below the surface, not only for the sake of the appearance of the

street, but to obviate danger of freezing in winter. Covers for such hydrants should be flush with the sidewalk, and properly marked. Objection may be made that in case of fire, such hydrants would be difficult to find, but this is overcome by signs placed on the buildings, directly over the hydrant, in the form of a red H, and by other sign intermediate, with arrows pointing both ways, giving the number of meters to the fire hydrants in either direction.

Letter boxes should be placed on the houses instead of on posts, and should be provided in ample numbers and painted a noticeable color. In Germany, they are painted a golden yellow.

The names of streets should preferably be placed on the corners of buildings, and each of the four corners should have the names of both streets. This is a cheaper and more effective method than the placing of signs on posts, which obstruct the sidewalk, and which, owing to the expense, are usually only placed on two of the corners, diagonally. The post method, is, however, at times a necessity.

When electric light posts are placed on the corners, a good form of street sign consists of a frame of four sides, carrying the names of the streets, two sides of the frame being parallel and the other two sides converging inwardly, the shorter parallel side, about 12 inches long, bearing the name of the main street and facing that street, while the long parallel side, bearing the same name, is turned towards the sidewalk, and is clearly visible to one approaching along the side street. The name of the side street is placed on the two converging sides, and therefore more clearly visible from street cars than if placed at right angles. The placing of such signs on lighting posts enables them to be seen readily at night.

The combination of a white letter on a blue ground has proven to be the best arrangement of colors.

No temporary stanchions for awnings should be permitted on the sidewalks, or awnings or canopies erected, leading from the building to the curb, as is done by hotels, churches, restaurants, dry goods stores and private hostesses.

If desired for permanent uses on hotels, stores, and the like, they should be permanent structures of appropriate design, without advertisements, and carried from the building itself. Marquises for windows should in no case be less than eight feet above the sidewalk.

Advertising signs or signs of any nature should not project from the building unless at least twelve feet above the sidewalk, and in no case should they project more than three or four feet. Any other method is unsightly and dangerous, while no useful purpose is served by the senseless competition in signs which results when no regulations are enforced.

No building should carry any sign except that of the business conducted in it, and the size and design of large signs on the tops of the buildings, of a permanent or semi-permanent nature, should be approved by the City Art commission.

A city may be said to have two individualities, or to produce two impressions: that created by its appearance during the day and that by its appearance at night. The latter is likely to be the more picturesque, and it is not infrequently the impression by which the city is best known. For this reason, as well as for the convenience and safety of its citizens, it is the duty of a city to have its lighting system planned with as much care and attention as is devoted to any other phase of its design.

Lamp posts, although a necessity, offer at the same time opportunities for decorative treatment, and they may thus be made to serve as an embellishment to the city, both by day and by night. Wiring, however, should, wherever possible, be carried underground.

In Germany the best practice in street illumination is to have powerful flaming arc lamps swung at some height, rather than to have more numerous and smaller lamps placed at a lower elevation. Although the tungsten lamp was originated and developed in Germany, it is very little used for street lighting in that country. Very few American streets would pass muster as to illumination in Germany, and it should therefore be the duty of American lighting

engineers to study the factors which have made for success there.

A new tungsten light for street illumination is coming into use abroad, however, the nitrogen-filled tungsten lamp, which runs up to from 2,000 to 5,000 candle-power and which may be developed up to 10,000, candle-power, far in excess of the arc lamp. It is the most economical of the high-power lamps and even superior to the arc lamp for street lighting.

As will be seen by the accompanying illustrations, most effective results are obtained by lamps placed high. The basic reason for so placing the lamps is to secure the most uniform distribution of light possible. The sun, a single light, furnishes the best object lesson in even distribution of light, and could a city be lit by a single lamp the result would be the most nearly ideal obtainable. Such a lamp would, of course, need to be hung at a great height and be of great power. From a commercial point of view it would not be economical, and the problem which confronts the lighting engineer is to proportion the height and power of the lamp so as to secure the most economical, effective and uniform distribution of light.

In Germany, where electric illumination has been for years a highly developed science, the fact has long been established beyond question, that the best results are obtained with arc lamps placed from thirty to sixty feet in height, according to their illuminating power. A directly contrary practice is much in vogue in America, that in which electroliers with from three to five tungsten lamps, at a height of from thirteen to sixteen feet, are placed at intervals of from thirty to sixty feet. This is a costly method of lighting, and one which is injurious to the eyes on account of the unequal distribution of light, the pedestrian being more or less blinded in the immediate vicinity of the light with contraction of the pupils, while a few steps further the pupils must dilate. This constant alternation produces a fatigue, the cause of which is not understood by the public. In cities abroad, with streets suitably lighted, the illumination remains unnoticed, being agreeably uniform.

A new form of high-powered arc lamp, placed at less than fifteen feet from the street level, is being introduced in American cities. The light being from a single point, the bad effects of the tungsten clusters just described are magnified.

However, American lighting engineers are beginning to recognize the value of the principles pointed out, and where they are free to do so, they take advantage of the opportunity to serve the public properly.

The superiority of German street illumination cannot be ascribed to any particularly favorable factors. It is rather a refinement at every possible point. The whole subject is treated in a thorough-going manner and improvements all along the line are adopted. Many well-lighted German cities spend less per mile than do American cities, though admittedly better lighted, so that the greater density of population in German cities does not account for the superior illumination. The cost per unit of operation shows also, when compared, that Germany has no special advantages over this country in either cost of keeping lights in operation or cost of carbons.

Among the causes which are to blame for conditions in the United States is that of lack of uniformity in systems and installations in most of our cities. Along a given street will be found municipal lighting systems supplemented by private lighting of a different character, which produce a jumbled and inartistic effect. Such conditions may arise from lack of power to handle the situation on the part of the municipal officials, laws frequently being required to authorize changes which should be under the control of an administrative officer.

For example, it often happens that a city is bound by law to pay no more than a stipulated amount per annum for each lamp. It is obvious that no company could afford to introduce a lamp costing perhaps twice as much, even if it produces several times as much light, until after some new laws had been passed, usually by aldermen who know little or nothing of the subject. Nevertheless, though slow

to gain adoption, improved forms of high candle-power are certain, on account of their economy, to make headway and in time to displace units of a lower efficiency in streets in which it is desired to have any real degree of illumination.

A further advantage of high-swung lamps is that they do not obstruct the streets so much and that they afford a much more effective method of illumination of the architectural features of the city. They are much more desirable, also, in the effect on the eyes, not producing the glare caused by the nearness to the surface of the clustered lamps.

Although it has been held that in some cases the requirements of merchants or the position of trees in residential districts may militate against the use of high lamps, it has nevertheless been found in foreign practice that the high lamp can always be adapted to produce results as good as the low lamp, if not better.

However, if adventitious circumstances necessitate the use of low lamps, ornamental metal standards of graceful design, equipped with tungsten lamps in artistic globes and with the wires underground, are much to be preferred to the ugly wooden poles carrying lamps and overhead wires, or to the festoons of incandescent lights which span the streets of some of our cities. A type of arc lamp which is coming into increasing use in the ornamental lighting system of American cities, and which appears to possess a high degree of efficiency, is the magnetite, or so-called Luminous Arc.

In European cities, a strong rival of electric illumination is the high candle-power gas lamp, and in many cities which operate their own gas plants and where the electric concerns are privately owned, it is found expedient to use the gas lamps. These are built for special purposes up to 5,000 candle-power per unit for high-pressure gas, and up to 3,000 candle-power for low-pressure gas, while the usual electric flaming arc is only about 2,000 candle-power. In the city of Berlin gas lamps are much used, as the city owns its own gas plants. In some of the mains a pressure of 17 pounds is maintained. In New York City the highest specified pressure is 1.16 ounces.

ILLUMINATION OF BRIDGE: EMPEROR FREDERICK'S MUSEUM, BERLIN

ELECTRIC ILLUMINATION OF THE MALL, CENTRAL PARK AND PUBLIC LIBRARY AT 42ND STREET, NEW YORK

In many foreign cities both gas and electric lamps are lighted and extinguished from a central control, and in addition in the electric lighting system, if a lamp is out of commission, the fact is automatically indicated in the central station.

Where overhead trolley systems are used, the trolley wire should be carried from the lighting posts or from buildings, and wherever possible, separate poles should be avoided, but if it is necessary to use them, they should not be merely dressed trunks of trees, but poles of appropriate and ornamental design.

The cultivation of shade trees has proven very advantageous in European cities, as the trees in affording shade increase the attractiveness of the street. They also reduce the amount of flying dust and temper the winds, improve the air and conduce to the healthfulness of the city. Shade trees should be planted two or two and a half feet back from the outside edge of the curb, and an earth surface of from two and a half to three feet in diameter left around the trunk for natural watering.

In addition to this, a desirable method of watering is that of gutter seepage, a hole being cut in the curbing, protected by a grating, and the water finding its way through the earth to the tree roots.

In some European cities, waste-paper baskets of meshed wire are placed at intervals around the trunks of trees and the bases of lighting poles. The bottoms of such baskets are some two feet above the surface of the street, and the tops two feet or so higher. It is the duty of the police and of the individual citizen to see that no garbage is thrown on the sidewalks or into the streets, since the baskets being conveniently placed, afford a place for such rubbish. The streets are thus much more easily cleaned, and do not so quickly become cluttered with rubbish.

European cities have solved in a most admirable manner the question of the removal of garbage. Two systems are particularly to be recommended for adoption in American cities, where garbage removal is conducted in the most

primitive, unsanitary and disgusting manner that could well be devised.

One system is that of individual wheeled cans or receptacles. They are filled by the householder and are self-closing. They are placed, at certain hours, on the streets, and are carted away without being opened, to be emptied at the incinerator, the householder being provided with another can.

This system protects the public and the employees of the department removing the garbage, and reduces the disagreeable features of garbage removal to a minimum. It is used, for example, in Munich and Dresden.

Another system almost equally effective, but somewhat more expensive in first cost, is that of providing pits in the sidewalk with a suitably hinged cover; the pit serving as a receptacle for a removable garbage can. The removal cart lifts the can out, and its contents are dumped into the cart, through a special opening in the top of the cart, which is a closed one, the can having a dump bottom. There is thus no opportunity for the contents to escape into the air. This system is highly desirable, since it keeps the unsightly cans off the streets and prevents the escape of particles of garbage.

Where ashes or refuse are dumped from open cans, the removal carts should always be closed, and provided with four openings for the ready distribution of garbage in their interiors.

In wide streets in which vehicular traffic is heavy, so-called safety isles should be placed to facilitate crossing. Such isles should be edged with granite curbing, some six inches above the crown of the street, and should be about four feet in width and of suitable length. They may be placed at the side of the street car tracks or in the center of the street and added prominence may be given to them by ornamental electroliers.

Pictorial advertising on a large scale on the streets is not favored abroad, where the advertising is confined either to newspapers or to small artistic posters placed on special

columns, some three or four feet in diameter, each of which carries a dozen or more posters. The effort is to attract attention rather by the artistic effect of a poster, than by its size.

Such advertising columns may with advantage be placed on safety isles, or in public squares or at spacious corners. The interiors of such columns are fitted with switches or transformers of electric distributing systems, or telephones for the police or fire departments.

For purposes of public convenience, news kiosks of an artistic design are placed in suitable locations. There may also be display advertisements on the news kiosks.

At important focal points are placed small structures for supplying meteorological information. On the outside, weather charts and forecasts are displayed, and thermometers, and barometers with continuous records of their fluctuations are provided. Condensed time-tables of arriving and departing trains and vessels are shown.

An additional feature found in such structures and throughout European cities, of great convenience to the public, and one which would prove of even greater convenience to the American public if placed in similar locations, is the electric clock. Not only on the meteorological stations are such clocks placed, but also at every few blocks at some convenient location. Such public clocks are electrically controlled and operated from a central point. They are attached to lighting poles, news and subway kiosks, advertising columns and in whatever location or position they will prove of the greatest use.

For purposes of fire and police protection, the German cities have an elaborate and well-organized signalling system. Fire alarm boxes are placed in conspicuous positions on ornamental posts, which carry some fifteen feet above the sidewalk, large red globes, which being constantly lighted, serve to indicate the locations of the boxes.

The police alarm system, which is excellently worked out, employs as one of its principal features, a signalling light similar to the fire alarm light, except that it is green in color instead of red.

For police alarm purposes, the city is divided into beats, each provided with several of the green signal lamps and alarm boxes.

Householders are provided with keys to the alarm boxes, and when a policeman is required, the citizen unlocks the alarm box, which causes all the green lights on the beat to show. At the same time, the citizen talks to the central station over the telephone in the box, and leaves the information as to where the policeman is wanted. The policeman on seeing a green light burning immediately goes to the box and gets his instructions, though should he report to the box from which the citizen is calling, he, of course, gets the information at first hand.

The system is also utilized whenever the central station has any instructions to convey to the police on duty, and it may readily be utilized to collect a large force of men on short notice at any desired point.

It serves in addition to keep tabs on the policeman on duty, while the officer himself can, in the same manner, summon assistance when necessary.

In addition to the lighting of the green light, a bell is also rung, which is of special use during the day, or when the officer is within hearing distance but does not have his eye on the green light, for the ear is always on guard although the eye may be otherwise employed.

The citizen's key cannot be withdrawn from the box after he uses it until an inner lock of the box is opened by the policeman. As the keys are numbered, any misuse of them is readily detected and properly punished and the key forfeited.

One of the advantages of the system is that a smaller number of police can be employed and quicker service secured.

The same methods are applied to the fire alarm signalling, as by means of the telephone the fire department can be informed of the exact location of the fire and thus be saved valuable time in first going to the fire alarm box and then having to hunt further for the fire.

The various foregoing regulations and systems are only a few of those which with great advantage are employed to increase the safety and comfort of city life. There is no reason why any of them should not be adopted in any city or town of considerable size.

The large number of regulations enforced in advanced European cities are an evidence of the degree of civilization and consideration for the comforts and rights of others, attained by such communities. Only negligence and a spirit of good-natured indifference prevents American cities from adopting the more drastic regulations.

In New York City, numerous regulations are in force, and recently a very important improvement has been adopted, which is now being carried forward on many streets, that is, the widening of the roadway at the expense of the sidewalks and regaining space for the latter by the removal of encroachments of buildings on the sidewalks, such as stoops, area ways, pillars, porticos and the like. Although bitterly opposed for several years, and though the removal of such encroachments has marred the lower sections of some of the buildings, which had for years trespassed on the street, the plans of the city have been carried out, and the process is constantly going on on all streets where traffic is congested. Following are copies of official papers in reference to the widening of one of the leading streets.

OFFICE OF THE

PRESIDENT OF THE BOROUGH OF MANHATTAN

CITY OF NEW YORK

April , 19 .

To the Owner or Tenant of the Premises
At No.....34th Street:

DEAR SIR — The Board of Estimate and Apportionment, at its meeting of March 9, 1911, adopted resolutions providing:

1. That the roadway of Thirty-fourth street, between Madison and Eighth avenues, be increased from forty to fifty-three feet;

2. That the width of the sidewalks be correspondingly reduced from thirty to twenty-three and one-half feet; and

3. That owners of abutting property be required to remove all encroachments or encumbrances between levels ten feet above the curb grade and of sufficient depth below said grade to provide the proper support for the street and sidewalk surfaces, and extending beyond the building line farther than allowed by the order of the Superintendent of Buildings of January 3, 1911.

This order affects encroachments of every description, including stoops, steps, courtyards, areas, platforms, porches, fences, railings, showcases, bay windows and ornamental entrances. Where areas are removed, the level of the sidewalk must be restored.

In pursuance of the direction of the Board of Estimate and Apportionment, I am preparing to proceed with the widening of the roadway, and, in order to give the sidewalks the width prescribed, will require that all encroachments or encumbrances extending beyond the limits mentioned be removed at the earliest moment, so that the work may proceed during the summer season. Encroachments that are not so far removed as to allow work to commence by June 1 will be removed by the City and the expense thereof charged as a lien upon the property affected.

A complete copy of the resolutions in question is attached, together with the order of

Yours very respectfully,
GEORGE MCANENY,
President of the Borough of Manhattan.

BOARD OF ESTIMATE AND APPORTIONMENT
CITY OF NEW YORK

Removal of Encroachments on, and Changing the Roadway and Sidewalk Widths of Thirty-fourth Street, between Eighth and Madison Avenues, Borough of Manhattan.

Resolved, That all ordinances, resolutions, permits or licenses heretofore adopted, issued or granted by The City of New York, or by any board, body, council or officer thereof, or by any department, division, bureau or officer thereof, permitting, licensing or allowing any stoop, steps, courtyard, area, platform, porch, fence, railing, showcase, bay window, ornamental entrance, or any other projection or encroachment of whatsoever kind or description on Thirty-fourth street between the easterly line of Eighth avenue and the westerly line of Madison avenue, between levels ten (10) feet above the curb grade and a sufficient depth below said grade to provide proper support for the street and walk surfaces be and they are hereby in all respects repealed, cancelled and revoked; and be it further

TWENTY THIRD STREET, NEW YORK

BEFORE AND AFTER STREET WIDENING AND REMOVAL OF ENCROACHMENTS FROM SIDEWALKS, NEW YORK CITY

BARBAROSSA PLAZA AND HOHENSTAUFEN, RING, COLOGNE

MAXIMILIAN STREET, MUNICH
ARBOREAL STREET EMBELLISHMENT

Resolved, That the widths of the roadway and sidewalks on Thirty-fourth street, Borough of Manhattan, between Eighth avenue and Madison avenue, be, and they hereby are established as follows:

The width of said roadway shall be fifty-three feet;

The width of said sidewalks shall be twenty-three and one-half feet; and be it further

Resolved, That this resolution shall not be deemed to in any way alter, amend or affect a certain order issued by the Superintendent of Buildings for the Borough of Manhattan, and approved by the President of the Borough under date of January 3, 1911, providing for certain ornamental projections as therein specified; and be it further

Resolved, That the President of the Borough of Manhattan be and he is hereby directed to construct said roadway to the said width of fifty-three feet, and the said sidewalks to the said width of twenty-three and one-half feet from the curb line, in accordance with the foregoing resolutions, except where there are existing encroachments or encumbrances which do not extend outward from the building line for distances greater than those given by the above mentioned notice of the Superintendent of Buildings, then said sidewalks to be constructed up to said encroachments or encumbrances; and where encroachments or encumbrances extend for greater distances than those specified from the building or house line, then the said Borough President is hereby authorized and directed to remove or cause to be removed all that portion or portions of said encroachments or encumbrances less than ten feet above the curb grade back to the distances specified; and he is further hereby authorized and directed to remove or cause to be removed all portions of vaults which may be found to exist below the elevation of the curb and extending beyond the new curb line, as above established, which are not altered by the occupants of said vaults, or the owners of the adjoining property, so as to make possible the physical change in roadway and sidewalk widths in conformity with the requirements of this resolution, and to the satisfaction of the Borough President.

I hereby certify that the foregoing is a true copy of a resolution adopted by the Board of Estimate and Apportionment at a meeting of said Board held on March 9, 1911.

(Signed)

Assistant Secretary.

NOTICE IS HEREBY GIVEN that on and after this date no building plans not already on file in this department, or in the Tenement House Department, will be approved by the Bureau of Buildings for the Borough of Manhattan which provide for an encroachment by any

part of the building beyond the building or lot line at any point less than ten feet above the curb grade, except that

(*a*) Non-supporting columns or pilasters, including their mouldings and bases, may project not more than two and one-half (2½) per cent. of the width of the street, and in no case more than two (2) feet beyond the building line.

(*b*) Steps leading up or down at entrances, and included between ornamental columns, pilasters or check pieces at least three (3) feet high, at the sides of such entrances, provided they do not exceed, together or separately, one-fifth (1-5) of the width of the lot, may project not more than two and one-half (2½) per cent. of the width of the street, and in no case more than eighteen (18) inches beyond the building line.

(*c*) Mouldings or ornamentations of a decorative character, and base courses, including the water-table, not exceeding five (5) feet in height above the curb grade, may project not more than one and one-fourth (1¼) per cent. of the width of the street, and in no case more than ten (10) inches beyond the building line.

(*d*) Rustications may project not more than four (4) inches beyond the building line.

Marquises or awnings, supported wholly from the building, will be permitted where they do not extend more than two and one-half (2½) feet on either side of an entrance, provided they are constructed of iron and glass or other incombustible material, and are properly drained.

Dated ————————

Superintendent of Buildings for the Borough of Manhattan.

Approved:

President of the Borough of Manhattan.

CHAPTER VII

WATERWAYS AND HARBOR IMPROVEMENTS

Harbor Improvements; Terminal Facilities; Water Gates; Canal Transportation

PRACTICALLY every large city in the world is a city of important waterways. Ordinarily viewed as an adjunct to a city's commerce, its waterways, however, will be found in almost every case, if not the chief reason for its existence, to be a factor of the first importance in its progress.

Cities which neglect their waterways fall behind in growth and prestige, and those that improve their harbor facilities forge ahead, in many instances, with wonderful strides.

The question of harbor improvements is thus one of the greatest importance, and it deserves the most careful consideration of those in authority and the support of all classes of citizens. Cities having great natural advantages must keep their equipment up-to-date, while cities with limited natural facilities may by well-designed improvements, lift themselves into positions of the first consequence, as many European cities have done in recent years, coming into successful competition with existing ports.

The port of Hamburg, which is 65 miles from the sea, is almost entirely a made port. For 35 miles the river Elbe has had to be dredged. Sixty years ago the channel of the Elbe had a depth of 15 feet at high tide, to-day it is 37 feet and by continuous dredging it will have a depth of at least 40 feet. The harbor when it is reached is a great sliceway of piers, basins and channels, dredged out of the lowlands, but affording unlimited docking facilities. The harbor, which in convenience and equipment is the equal, if not the superior of any in the world, is wholly the result

of German progress and energy. Some $100,000,000 has been spent in the harbor developments and at present it is spending $50,000,000 more.

The example of Hamburg is one that should inspire other cities to improve their facilities and increase their traffic.

Another example is found in Montreal, which though a thousand miles from the sea, has become the greatest summer port of the north, $40,000,000 having been spent, and its commerce increasing from $25,000,000 a year to $71,000,000 a year within fifteen years.

In making harbor improvements, the true purposes and reasons for harbors should be kept in view, and the improvements planned to be successful both from an engineering and a commercial point of view.

The principal purpose of a harbor is to furnish a means of transference of freight between inland and seagoing carriers.

The harbor which affords the cheapest and most expeditious means of transference will attract the greatest patronage, provided its location is not such as to be a handicap. Vessels do not seek so much a spacious harbor as they do one in which they may quickly discharge their cargoes and reload, at small expense, so that a city, by the erection of a breakwater, the dredging of a creek or river and the construction of modern docks laid with railroad tracks, permitting cars to be brought alongside the vessels, and fitted with the latest facilities and mechanisms for loading and unloading, will be in a more advantageous position than a city in which the natural harbor is better but in which modern systems have not been installed.

The commerce of an inland city is composed of freight handled by inland carriers, such as railroads, river steamers, canal boats and other forms of transportation, and coastwise and overseas freight, and in addition, the products of its own factories.

The arriving freight is for four principal purposes: immediate transshipment, storage for later shipment, material

HARBOR AT NEUSS ON THE RHINE

Five electric operated semi-portable cranes for loading and unloading river boats

PART OF EAST HARBOR AT FRANKFORT—ON—THE—MAIN

Equipped with twenty-four stationary loading bridges, twenty-one electric operated cranes and seven traveling loading bridges

HARBOR AT HAMBURG

HARBOR AT BREMEN

Electric operated traveling cranes for loading and unloading sea-going vessels

for the city's manufactures, or goods for consumption in the city itself. The facilities of the city should, therefore, be planned so that the freight for each of such purposes is handled in a different manner. Freight intended for immediate transshipment from cars to vessels, or vice versa, should be handled on piers laid with railroad tracks, equipped with loading and unloading appliances, so that the cargoes may be transferred with as little intervention of labor as possible, and with the greatest speed.

Such piers need not be placed in close proximity to the business districts of the city, as any point in the harbor to which railroad tracks may be conveniently run, will answer the purpose. A ship receiving part of its cargo from railroad cars may also, at the same time, take on freight from a canal boat, and thus the transshipping piers had best be placed near canal and railroad freight terminals.

Freight intended to be stored in the city for future shipment, should be placed in elevators or storage warehouses accessible to both rail and water transportation, but similarly away from the business districts of the city. Particular care should be taken to avoid the placing of terminals and storage warehouses in such manner that freight has to be handled by being trucked across the city.

Freight intended as material for manufacture in the factories of the city, should, whenever possible, be delivered by rail or water direct, while finished products should be removed in the same manner. The advantages of rail connections are appreciated by manufacturers, who accordingly have a spur or switch run into their factories wherever possible, but the value of canals is not so well understood.

A system of canals in a manufacturing district proves of the greatest utility, especially for products of a bulky nature.

Freight intended for consumption in the city itself should be arranged for delivery to a number of points, in the most direct manner possible.

The principle to be followed in handling the freight of a city is to carry it as nearly as can be to its final destina-

tion in its original carrier without breaking bulk, and with the least expenditure of time and labor. The use of the truck, a most unsatisfactory and expensive method of transportation, should be avoided or minimized.

In the handling of passenger traffic to and from vessels, it is desirable to have the railroad depots adjoining the piers, especially for passengers not intending to make the city their destination. In this way, the city streets are freed of a great volume of transportation of no useful purpose, and the time of the passengers is saved. In Hamburg and Bremen not over half an hour is spent in transferring passengers and baggage from vessel to cars, including customs inspections.

Cities on rivers at some distance from the sea may increase their commerce greatly by improving their harbor facilities in the manner adopted by Hamburg, while inland cities on rivers have an almost equal opportunity. Frankfort on the river Main, borrowed $18,000,000 of which $6,000,000 was spent in acquiring lands and $12,000,000 in making improvements. An area of 110 acres was excavated, and a river port with the latest equipment constructed. The city will, eventually, however, not only not be put to any expense, but will realize a direct profit from its operations, since 720 acres have been reserved as sites for factories. The river traffic encouraged by the harbor improvements will serve to develop new industries and the city will thus indirectly benefit generally while directly disposing of its factory sites at a figure over the whole cost of the improvements. The wisdom of such a course is obvious.

Düsseldorf on the Rhine has carried out improvements and has developed an enormous river traffic, while at the same time the traffic of St. Louis has decreased to almost nothing.

Duisburg on the Ruhr has also made very important harbor improvements and its trade and population have increased largely on that account.

Practically every city of any size located on a river is built on both sides of the stream, though as a rule the por-

tion on one side predominates, while the portion on the other side will often bear another name. Unless, however, the river is of unusual width, the two portions should be treated as a unit in the development of their city plan, and certain structures only should be permitted on one side or the other of the river. A city of a most interesting character can thus be created, as the river adds to the picturesqueness and variety of a city's plan, beside setting limits from which the plan may be developed.

Cities which are seaports offer similar opportunities for the working out of interesting features, and the sea wall may be varied with parks, docks, terminals, gateways and the like.

Water approaches with sea gates or landing piers may often with advantage be made an integral part of a city's plan, with a broad avenue or boulevard leading to the civic center, and the most prominent building of the center facing or in the vista of such an avenue.

Sea gates should be made of a monumental character, and sea walls and other structures should be of a permanent and well-designed character. Piers facing streets should be treated in the proper architectural spirit, and in construction should be of a fire-proof nature. It is usually desirable to run boulevards parallel to the water fronts, with a narrow park along the whole front, thus providing a convenient place for recreation along the water, usually the most agreeable part of the city, but too often taken up for business purposes.

Recreation piers should also be built in adequate numbers, and reached through the riverside parks. Inland cities in the United States, on rivers, have in almost all cases surrendered their riverside park sites to business purposes, the residential districts being driven back into the land districts.

Water fronts should be reserved for park purposes instead of being taken up by railroad tracks, storage yards and other accumulations, for since railroad haulage in cities is to-day largely by electric locomotives, the railroads, if

they must run along the water front, may be put in tunnels, which will leave the space for parks.

In New York for example, it has been proposed to cover the tracks of the railroad running along the river's edge at Riverside Drive. As the Drive is at a considerable height above the Hudson, with a narrow park running down to the tracks, it would be feasible to roof the tracks over, leaving windows on the water side, and placing a promenade over them. This park space could then be extended many feet out into the river, and would be an improvement of great value obtained at small expense.

Harbor facilities need not be interfered with by the use of water fronts for parks, as with a proper arrangement space may always be found both for the parks and for the commercial uses of the water.

Without exception German cities so placed as to be able to develop their harbor facilities have done so, and German maritime commerce has thus received the greatest impetus. The merchant marine tonnage increased from 1875 to 1909, 159.7 per cent, a period during which the American merchant marine lost ground.

Germany has 190 harbors on the North Sea and 60 harbors on the Baltic, and the number of sea-going ships of over 10,000 tons hailing from sixteen of the principal ports, and their gross registered tonnage was 4,207,970 on January 1, 1909.

In addition to the harbor of Hamburg, two other ports among the greatest on the continent, those of Antwerp and Rotterdam, are largely of an artificial nature. Indeed, the city of Rotterdam, though very ancient, never became of any consequence until it developed its harbor.

The importance of harbor improvement is realized in England also, where a number of ports have undertaken extensive improvements, London, however, remaining content with existing conditions and falling behind in the march of progress.

Liverpool has spent $200,000,000, Manchester and Newcastle $85,000,000 and Glasgow $44,000,000. Manchester

DOCKS FOR NORTH SEA TRAFFIC, HAMBURG

CHELSEA DOCKS, NEW YORK

HARBOR FOR DIRIGIBLE AIR SHIPS FOR PASSENGER TRAFFIC AT POTSDAM, GERMANY

There are many such passenger stations throughout Germany

determined to free herself of Liverpool tolls and built a canal 35½ miles in length, and from 290 to 370 feet wide at the top, 120 to 170 feet wide at the bottom and 26 feet deep, which furnishes an outlet to the sea, completed in 1893, that adds enormously to the city's trade and commerce.

American cities in many cases are alive to the benefits of harbor improvements. The city of New York, although having a harbor of great natural advantages, is constantly expending large sums for its improvement. Its piers and docks are city property, and in co-operation with the Federal Government it is planning great additional facilities in Jamaica Bay, in the southern part of Brooklyn, a swampy overflowed section which is to be dredged and converted into an immense freight harbor. The Government will spend some $7,430,000 on the fairway entrance from the sea, and the city will ultimately spend $70,000,000 on the inside improvements.

An interesting feature of New York's harbor facilities is seen in the Bush Terminal System. This consists of some seven piers, each 1,400 feet in length, through which are laid railroad tracks. Tracks also lead from the piers into a series of large buildings adjoining, which have as tenants numerous manufacturers, who are thus saved the expense and delay of street transportation of their products, as they receive their raw material and ship their products directly by rail or water from their own floors. The success of the system has been so great that it is proposed that the city buy it and largely extend it.

As has been indicated, in harbor improvements one of the chief features is to arrange the docks so that railroad cars may be run alongside the vessels and freight be quickly exchanged.

This is best accomplished by modern forms of cranes, and great economies are effected when such apparatus is properly designed. In certain harbors, the engineering features are such that vessels may be loaded from cars on two or three tracks, simultaneously, and two to three cranes

may take cargo from one hatchway without interfering with each other. The very latest and best machinery, however, should be adopted, as great advances have recently been made in this field, and the difference between new equipment and out-of-date equipment will prove of the greatest importance to the commerce of the port.

Hamburg, where advantage has been taken of the latest developments in harbor engineering, has thus a great advantage over New York, where very few piers are laid with railroad tracks, and where not a single pier is equipped with loading and unloading cranes, the truckman is found in all his glory, his charges for small lots equalling in many cases the cost of long railroad freight hauls.

Hamburg in 1911 possessed 130,000 lineal feet of quays for ocean liners, more than 5,000,000 square feet of sheds and 805 cranes for loading and unloading ocean and river vessels.

The docks of Hamburg harbor vary in length from 2,500 to 3,500 feet and on both sides of the piers are run travelling cranes. There is at least one crane for every 65 feet of pier; they are all electric operated. Some five or six ocean-going steamers can lay alongside each of such docks. The fairway between the docks is some 750 feet in width, so that between the rows of ships on either side at the docks, a row may be made fast to the mooring posts in the middle of the fairway, discharging cargoes into lighters, for which purpose floating cranes are at hand. One of the principal piers in Hamburg has a length of some 5,000 feet, and it will thus be seen what modern engineering has accomplished in harbor improvements, since the situation at the outset was highly unfavorable.

In 1912 the Port of Hamburg cleared in imports and exports 25,000,000 tons valued at over $2,000,000,000. The tonnage was 2,000,000 in excess of 1911.

The three Ports of London cleared in exports and imports $150,000,000 less than Hamburg.

One of the reasons for Hamburg's predominance is that it is a free port, goods being warehoused without customs duties being levied.

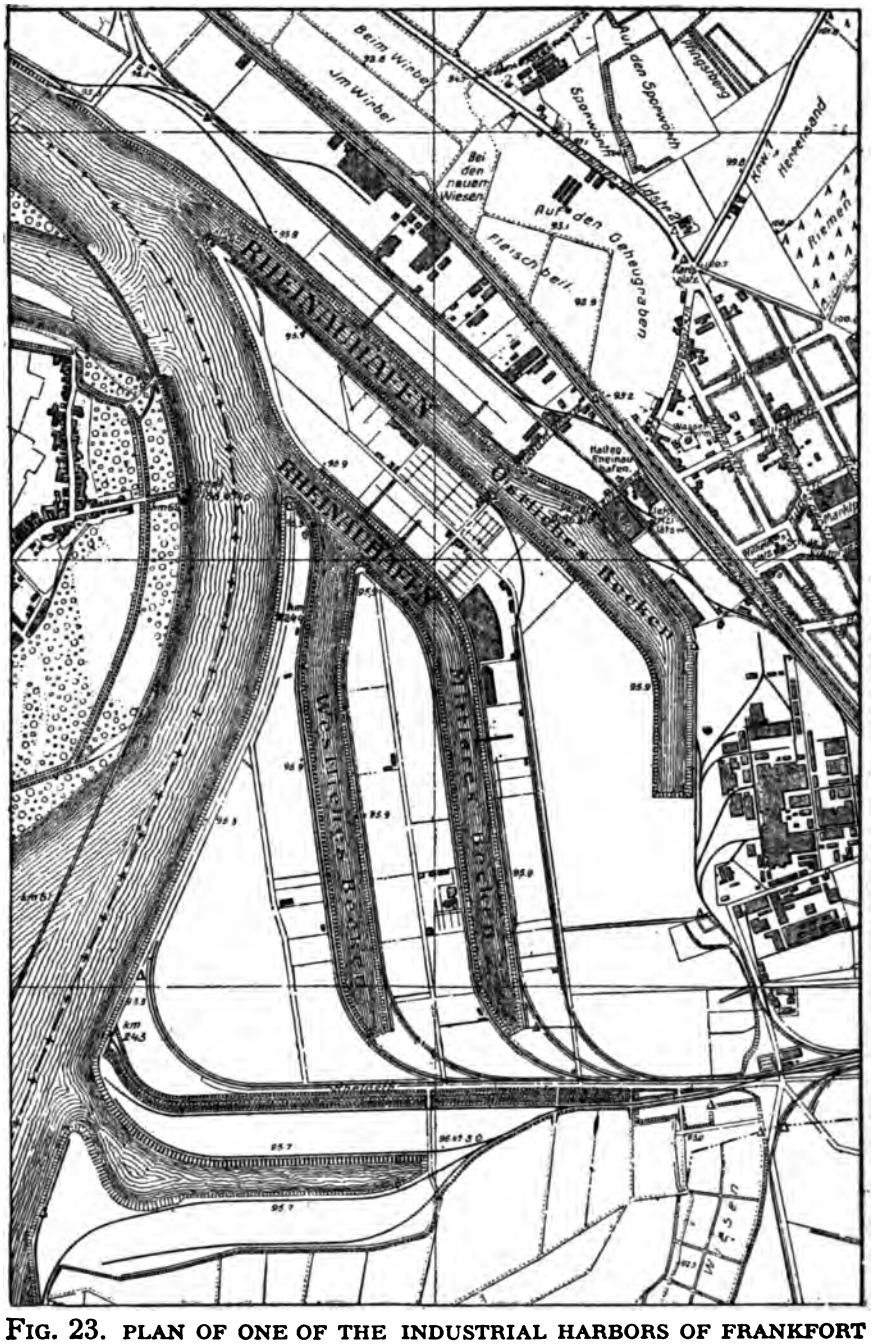


FIG. 23. PLAN OF ONE OF THE INDUSTRIAL HARBORS OF FRANKFORT ON THE MAIN.

Commerce, Industry and Public Welfare have been greatly stimulated since the building of these artificial Inland Harbors.

New York would greatly benefit by being similarly a free port.

If American cities having harbors do not want to make radical changes at the end of another ten years, it goes without saying that comprehensive systems must now be laid out to accommodate the traffic that the future will surely bring.

One American city which has profited greatly by harbor improvements is Buffalo, which had, in fact, no harbor at all, but which, by the erection of a sea wall, has remedied its natural disadvantages and is now in point of tonnage the tenth port of the world.

Boston, on the other hand, with a splendid natural harbor, has failed to keep its facilities up-to-date and the increase in the size of vessels has been such that many cannot longer enter the port, a condition which would not have arisen had Boston deepened her channels as New York has done.

Boston has consequently lost heavily to other ports, but the lesson is now being learned, as the legislature of the state recently appropriated $12,000,000 for the purpose of improving the harbor.

Baltimore, since the fire, has spent $6,500,000 on docks and piers, to retain her maritime trade.

The Pacific coast ports are showing the greatest activity in the development of their harbor facilities. Los Angeles, by a consolidation with Wilmington and San Pedro, will have a shore front 22½ miles long. The city has spent $3,000,000 and the three boroughs in the next ten years will spend $1,000,000 a year on harbor improvements. Large improvements are also being made at Seattle and Portland, Oakland, San Diego and San Francisco. The State of California will spend $10,000,000 on the extension of the state-owned docks at San Francisco, and Oakland is spending $3,500,000 on strictly municipal docks. The state will also spend $1,500,000 for state-owned docks at San Diego.

A considerable part of this activity is due to the approaching opening of the Panama Canal, which will prove an

WATERFRONT PROMENADE, KIEL

Vantage point from which Kaiser Wilhelm views the battleship maneuvers
The Imperial Yacht Club Building in the foreground

THE JUNGFERNSTIEG, HAMBURG

Picturesque water-front square and landing platform

THE THAMES EMBANKMENT, LONDON

A famous water-front promenade

enormous factor in the development of the Western states. Indeed its effect on the commerce of the whole country will prove highly stimulating, while foreign countries, even more than the United States, foresee its advantages. The Hamburg-American line is building a great number of vessels particularly adapted for the canal trade.

New York will also share in the benefits of the opening of the canal, since the distance to the Pacific ports will be so greatly reduced. Honolulu will be but 4,465 miles, Yokohama, 10,046 and Hong Kong, 11,607 miles.

The Panama Canal will undoubtedly prove the greatest boon to commerce of any artificial waterway ever constructed or ever possible of construction.

Another work of great importance being undertaken is the seaboard canal, a series of waterways connecting landlocked water areas along the Atlantic, which, when finished, will enable barges to be towed from Boston to the Gulf without going out into the sea, or exposure to storms.

It is the duty of all American cities located on waterways, to use every effort to increase their harbor facilities, for water transportation, owing to its cheapness, enables merchants to sell goods at lower prices and at greater profit, and stimulates every line of industry.

It is far better for a country to have a large number of thriving maritime cities, than to have its whole commerce handled by a few large ports. With fair railroad rates, which are now assured by the Interstate Commerce Commission, and with the opening of the canal, American cities which are seaports should experience a great increase in prosperity. They should be prepared to take every advantage of it by proper harbor facilities.

CHAPTER VIII

BRIDGES AND BRIDGE APPROACHES

Æsthetic Features — Co-operation of Engineer and Architect — Bridge Approaches — Various Types of Bridges

Of all the structures erected, the bridge is possessed of the greatest individuality, unity and feeling. It is at once an inspiration and a utility, and it marks as no other structure does the progress of man from barbarism to civilization. It is one of his greatest triumphs over nature's obstacles, for it is not only an evidence of his ability to merely construct, that is to place one stone upon another, but of his ability to think and so to utilize the forces of nature as to cause one stone to stand upon another with nothing directly beneath.

A building can never produce the sense of unity of the bridge and thus can never inspire as the bridge does, because while portions of a building may be eliminated and still leave it a building, the elimination of a portion of a bridge means its destruction for the purposes for which it is erected.

The bridge occupies thus a unique position among the structures of man, approached only by the dam, to which, however, it is far superior, since the dam always lacks in the sense of self-evident security which the bridge imparts.

Not only is the bridge unique in its position among structures, but it is the largest single structure erected by man and the most costly. It is also highly important in point of numbers and in the investment involved. There are for example some 80,000 metal bridges in the United States or one for every three miles of railroad, and they aggregate 1,400 miles in length, representing an investment of $800,000,000, or several times the cost of the Panama Canal. The subject of bridges is therefore one which demands the most

careful attention of all who have to deal with it. It is not a subject which should be reserved to the officials and engineers in charge, but is one in which the public should take an active and decisive interest. When a bridge of any consequence is to be erected the designs should be open to public inspection, and all objections and suggestions should be dealt with in advance.

All phases of the question should be considered: the æsthetic appearance of the bridge, its engineering features, its location, capacity, future uses, cost, operation costs, durability, materials and effect on the city's growth, and only after a thorough consideration of every feature should its construction be proceeded with.

The pleasing psychological and æsthetic effects of bridges have been recognized since the earliest times, but great bridges are a result of modern invention, being dependent upon the cheap production of steel for their evolution, since stone bridges have never been constructed in anything like the great spans of the modern steel bridges. The railroad, too, has greatly increased the necessity for bridges, so that except for the comparatively small stone bridges of ancient and mediæval times, the principles of which were early mastered, bridge building is a modern science.

The success achieved has been little less than stupendous in a material and engineering sense, for enormous structures have been erected which meet the demands of traffic and the various conditions which were presented.

In two respects, however, the modern bridge is for the most part a great failure. It is neither artistic nor will it have the long life of the ancient bridges. The Romans two thousand years ago built bridges which are in use to-day, but no modern metal bridge even with the most careful attention can be expected to last even a small part of such a period. Even if protected from the action of the elements, the steel which might then be reasonably expected to last indefinitely will be subject to crystallization from the effects of vibration. Thus all our steel bridges are temporary structures. This, however will in the most cases prove a matter of congratu-

iation, as when they pass away, they will be undoubtedly replaced by more artistic structures. Only our stone bridges, however, may be expected to endure into the eras of new races, if such are to succeed us.

But the more striking defect in our bridge construction is the lack of artistic talent shown in their design. For the most part they are like skyscrapers, masterpieces of ugliness and purely utilitarian in every sense. In the pressure to get enough bridges built to accommodate the traffic, they have been built with little or no sense of æsthetic effect, and are accordingly without beauty or individuality.

The engineers have been wholly content to erect bridges that would stand up, but while successful in this, the appearance of the bridge has been utterly neglected, for the great majority of bridges are of not too good engineering design, containing far more metal than is necessary in certain parts while other parts too little. This is proven by the frequent strengthening of and additions to existing bridges, the removal of tracks, and their unnecessarily high cost. Thus our engineers can only be credited with the roughest kind of work, which is not to be wondered at, since the mind that would be satisfied with an æsthetically ugly bridge cannot be expected to avoid imperfections in the practical side of the bridge's design.

The great importance thus of the bridge, both in the practical and æsthetic life of the city, demands that its design and construction receive the utmost care and attention. No single part of the plan of a city, with the exception of the civic center, is of greater importance than its bridges. The civic center may be likened to the main hallway of a building and the bridges to the portals. Often the first impression of a city and frequently the most lasting one is gained from a bridge, and as the entrance to the city it should be treated with the dignity it deserves and be made a feature of the city's plan rather than a mere encroachment of a utilitarian nature.

A bridge should be considered æsthetically from three principal points of view: the bridge itself, the bridge in its

WATER FRONT PARK AND LIGHT-TRAFFIC BRIDGE AT BONN

HEAVY TRAFFIC BRIDGE AT COLOGNE

Two monumental bridges over the Rhine

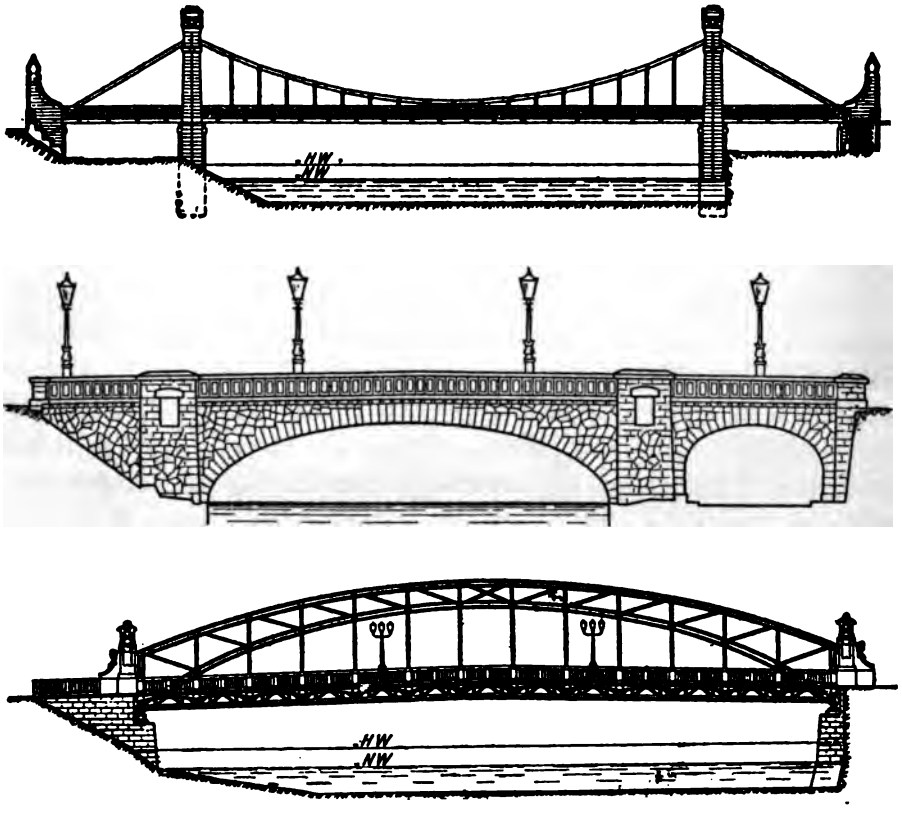
ALEXANDER BRIDGE, PARIS

SPREE BRIDGE, BERLIN, CHARLOTTENBURG

Superb examples of modern aesthetic bridges

relation to its approaches, and the whole effect of the bridge and its approaches in relation to its environment.

In its design it should be regarded as an integral part of the city's plan and it should be located in reference to the whole plan of the city in such a way as to produce the most



FIGS. 24, 25 AND 26. DIFFERENT TYPES OF BRIDGES. SUSPENSION, STONE AND ARCH CONSTRUCTION

Borsig, Hobrecht and Achenbach Bridges, a few of the many æsthetic Bridges in Berlin, which greatly add to the Convenience, Traffic Facilities and Picturesque Appearance of the City

efficient and pleasing result. A bridge may for example serve as a terminal or focal of an important avenue or for several converging avenues, full advantage thus being taken of its architectural importance.

Its location having been determined, the bridge itself should be of such a design as to meet in the most direct and

practicable manner the conditions it will be called upon to fulfill, and its approaches should be of such a character as to enhance its value rather than, as is so often the case, of such a character as to detract if not ruin its entire effect.

In order to achieve the proper result it is necessary for the bridge engineer to co-operate with the architect in the design of the bridge and its approaches and with the city planner or civic architect in its relations to the plan of the city as a whole. Unless this is done, bridges will continue to be ugly, misplaced and ill suited to their purposes.

Numerous contributory causes, however, in addition to the lack of co-operation between engineer and architect, go to produce the inartistic effect so prevalent in American bridges, among which are absence of governmental supervision, necessity of keeping cost at the minimum, legal hindrances, haste in construction, undue competition and use of contractor's plans or of one set of standard plans for numbers of bridges, imitation of railroad bridges for other places and the absence of any well-settled forms for the artistic treatment of iron construction.

The last-named reason is one of considerable importance, since, like skyscrapers, modern metal bridges are a modern structural form and there has not as yet been time nor talent enough given to the subject to develop a satisfactory architectural treatment. In this quarter, however, American designers have much to learn from European practice and examples, as the problem of building bridges of artistic construction is being solved with splendid results.

In the æsthetic design of a bridge, it should be remembered that the bridge is a work of architectural art and that as such it should conform in its own field, with the general principles of artistic design which have been noted as being the rules of city planning in general.

The first principle is that of unity. The bridge with its approaches should produce the impression of being a single homogenous structure. It should also show appropriateness to its surroundings; it should be symmetrical, harmonious in proportion, simple, obvious in the relation of its structure to

its purposes, economical in the use of material and embellished without over-ornamentation.

With the bridge itself constructed in accordance with such principles, its approaches should be treated in a similar spirit and made to add to the dignity and effect of the bridge. A plaza suitably laid out is almost a necessity for a bridge of any size, while a suitable view of the bridge as it is approached is another essential. A glaring violation of this principle is seen in the approaches to the Brooklyn Bridge, in itself one of the finest of the bridges of this country, but which has at each end a huge barn-like terminal structure, effectually concealing the bridge as it is approached.

The terminal plaza may even with good results be a park of some size, suitably laid out and embellished, and the bridge thus be given the benefit of a most favorable approach.

The principal types of bridges are the arch, the suspension, the cantilever and the truss. The selection of type will depend on natural conditions and on question of traffic, cost and materials. Thus a narrow stream with high banks over which a considerable vehicular traffic is to be carried may well be bridged by a stone arch type, while a wide river with islands to be bridged for railroad purposes may best be bridged by a cantilever, especially if the swiftness of the current prevents the erection of the falsework necessary in the construction of an arch bridge.

While its first cost is great, the erection of a stone arch bridge should always be considered, where the span is not too great, since in artistic effect the stone bridge is most pleasing, and when its centuries of permanency are considered the cheapest in ultimate cost. A recent stone bridge with a span of 328 feet (100 meters) has been erected at Rome, which is the limit at present in size for this type.

In reinforced concrete bridges the most beautiful artistic effects are to be obtained. It is a new form of bridge, however, which requires the highest degree of skill both in design and construction, but in which splendid results have been obtained, exceeding in length the limit of stone bridges and

having a graceful delicacy and loftiness of effect in remarkable contrast to the ponderous effect of the stone bridges.

The metal arch bridge is widely developed in a great variety of forms, with arches ranging up to 1,000 feet in length, as in the proposed Hell Gate Bridge, at New York City.

The cantilever form of bridge is the most difficult of all in which to obtain artistic effect, although good effects are not impossible. It readily admits long spans, however, and is often the type selected from commercial and utilitarian reasons. Generally speaking the cantilever bridges are ugly, and, not obviously disclosing their principles in their construction, are but little understood by the public.

The suspension bridge is a form which is of great natural beauty and simplicity. It is particularly suitable to enormous spans, such as the Brooklyn Bridge, which is 1,595 feet between towers, but it is a type in which the weight of the bridge should be large in comparison with the live load carried, and is not therefore a type suitable for small bridges.

The truss is a form for short and medium spans and is widely used on railroad bridges. It is usually very ugly but is cheap and efficient.

Plate girder bridges, a form of truss, are used for very short spans, such as viaducts over streets, but if properly treated not only need not be ugly but can be of a very ornamental effect.

A determining feature in the design of bridges is the relative position of the roadway, which may be placed at the top, at the bottom or intermediately. Old Roman stone arch bridges of semi-circular arch form, the only type of arch they built, with roadway at the top and numerous small spans in the center, have never been surpassed in substantial dignity and æsthetic effect, though modern arch bridges with their arches in ellipses and segments of circles are more graceful in effect. The suspension bridge is among the finest of the forms in which the roadway is at the bottom.

Although artistic bridges may appear more expensive, yet with proper engineering, the material saved as compared

with a badly designed bridge will more than compensate for any extra cost of the artistic form.

The best method of securing the proper design of bridges is that followed to a large extent in Germany. Competition plans are invited from engineering concerns of standing, principally having in view the æsthetic appearance and approximate cost. The three best plans are awarded prizes and, upon being paid for, become the property of the city, which thereupon calls for definite proposals for the erection of a bridge in accordance with first prize winning plan. The various competing concerns submit bids with detail drawings, and the best bidder is awarded the work. Thus it may happen as it occasionally does that the concern submitting the design adopted only gets the prize and not the contract for the erection of the bridge, although the prize-winning concern has much the best chance of being awarded the contract.

A system of this character would undoubtedly have the effect of greatly improving American bridges.

CHAPTER IX

TRAFFIC AND TRANSPORTATION

Electric Traction; Surface, Elevated and Subway Traffic; Statistics of Rapid Transit; Moving Platforms; Vehicular Traffic; Naming of Streets

With the growth of a village into a town and the town into a city, its area becomes so extended that artificial means of transportation are necessary. It is no longer possible for the citizens to transact their business afoot, and the larger a city grows, the more numerous and speedy must its transportation facilities become.

The trolley car, of the various forms of transportation which have been evolved, is the one that has been most widely adopted, and of late years, to an increasing extent, since the use of electricity has been developed.

This vehicle, although in wide use for less than a generation, has proved one of the most important factors in the growth of cities and suburban communities that has ever been invented. The demands for quicker street transportation produced in large cities, the cable car and elevated steam railroads, but both were more or less unsatisfactory, and the horse car remained for the greater part of the traffic of the large city and for the whole of the traffic of the smaller cities, the only expedient.

Electric traction, however, has superseded both the cable car and the steam elevated road, and has made possible the subway and river tunnels, which were previously out of the question, owing to the smoke of locomotives. Electric transportation has made surface travel as speedy as is consistent with safety, and it has enabled business to be concentrated in the centers of cities and homes to be located in the outlying districts. Electric traction has thus in a few

NEW AND TYPICAL AMERICAN RAILWAY STATIONS

Union Station, Washington, D. C., Grand Central Station, New York, and the Pennsylvania Station, New York

RAILWAY STATION, COLOGNE

RAILWAY STATION, FRANKFORT–ON–THE–MAIN
Forecourt squares for traffic distribution

decades released the city from the bondage of slow transportation and has stimulated urban growth in a way that would never have been possible under other conditions.

The only rival of electric traction is the automobile, for the most part, a gasoline engine driven vehicle. In the form of coaches or busses, it is used to a great extent in London and to a lesser degree in other cities, but it seems quite unlikely that it will ever become a serious rival of electric traction in the form of cars on rails.

As a civic problem, therefore, transportation reduces itself to the best method of laying out street car routes and subway and elevated systems, and the proper regulation of vehicular traffic.

The transportation system of a city should be so arranged as to furnish as direct a means of transportation as can be obtained, from every point in the city to every other point, at a single fare, and to furnish ample facilities without congestion.

A highly desirable object, in the transportation system of a city, is to have the cars reasonably filled at all times, since this reduces the cost. In cities in which the residential districts are at one end, and the business and manufacturing districts at another, this cannot be accomplished, as the cars must run empty away from the business districts in the morning and empty toward them in the afternoon. If, however, the business district is in the center of the city, the street car traffic may be arranged to much better advantage, as routes of cars may be laid out to traverse the city from end to end, passing through the business districts, or transferring to lines that do.

One of the best systems of tranfers is that in which a loop or belt line runs around and just outside of the civic center, with all cars passing over the loop or portions of it and transferring to all other cars. For example, in a city laid out on the radial plan, eight lines double tracked will serve to traverse sixteen of the radial avenues, each line on reaching the loop passing around half of it in a semi-circle and continuing on out the radial avenue directly opposite

FIG. 27. DENSITY OF POPULATION OF PARIS

the one by which it entered the loop. Each line would thus have seven transfer points from each of which the passengers could proceed in either direction over the seven other lines covering the other fourteen radial avenues. A number of

FIG. 28. VOLUME OF TRAFFIC IN PARIS, INCLUDING BELT AND STREET RAILWAYS, SUBWAY AND OMNIBUS LINES

The width of the Lines is in proportion to the respective volumes of Traffic

transfer points serve to distribute the traffic with less congestion than if the transferring were all done at a single point.

If the traffic of the city is heavy, it is advisable to have the loop constituted of several sets of tracks in parallel, in order that the cars of the different lines will not be subject

to delay by those of others. An example of the necessity of ample loop facilities is seen in the Brooklyn Bridge Terminal in New York, where eight fishhook-shaped loops are needed to handle the cars which stream across the bridge over a single track.

In connection with such a system of radiating car lines or lines intersecting at the center of the city, circumferential or belt lines at different distances from the center of the city, transferring to all the lines intersected, will serve to make the transportation facilities complete.

In cities in which the plan is such that a loop cannot conveniently be laid out, a system which obtains much the same results is that in which all the lines converge and pass through a traffic square, which may contain a number of tracks with the transfer points for transferring to all lines conveniently arranged.

Street cars in cities are principally useful for short haul traffic, since speed is not possible in the congested districts and long hauls are both unprofitable to the operating companies and wasteful of the time of the passengers. Only when the trolley car reaches the outlying districts, where greater speed is permissible, can it be regarded as a means of real rapid transit.

For the purpose of transporting large numbers of persons over considerable distances, recourse must be had to trains of cars, having the right of way and making but infrequent stops. This condition can only be obtained on elevated or subway roads, or by means of railroads with their suburban traffic lines running into terminals well within the heart of the city. Such lines should be laid out with the idea of distributing traffic from the main arteries of the city to the outlying districts, and should be so arranged as to accommodate both local and express traffic, that is local lines with stops every five or ten blocks and express lines with the fewest possible number of stops between terminals.

Elevated roads, though cheaper in first cost than subways, should not be constructed if they can be avoided, as the depreciation to property due to their presence, and other

features of a disagreeable nature, more than offset, in the long run, their cheapness.

A somewhat more satisfactory system for lighter traffic is the suspended railway, in which the cars travel on monorails, the cars being below the rail. This system is less noisy, does not darken the street so much or prove the obstruction that the usual elevated structure is. Short curves can be taken at higher speeds, and the structure can be more readily run above canals or other waterways. It is cheaper in first cost and in operating cost, and it is in successful use in Europe, though never having been introduced here.

Subways have proved a very popular form of rapid transit in all the principal cities of the world. They do not spoil the appearance of the streets and, when properly designed and operated, are a quick and pleasant method of transit. By means of three or more tracks, they can easily be arranged to accommodate express traffic.

Subways should preferably be located as near to the street level as possible, to be readily accessible without recourse to elevators or escalators. However, between the ceiling of the subway and the street surface, sufficient space should be left for the proper gas and water mains and sewer pipes. In addition, this will furnish sufficient soil for the growth of shrubs and small trees in the grass plots along the sidewalks.

Public opinion abroad demands that subways and elevated roads receive the proper treatment from an artistic standpoint, especially in order that a sense of harmony may be obtained in a given locality.

An instance of this was seen in connection with the construction of the elevated and subway road in Berlin, some fifteen years ago. There was, to begin with, decided opposition and prejudice to such a structure, and although the plans, when presented, incorporated designs and artistic features which are wanting in the elevated structures of New York and Chicago, the promoters of the undertaking were forced to call further upon the talent of the country

for competitive plans, for the purpose of securing designs, not only of stations, but of the entire structure, including viaducts, etc., which would be acceptable from an æsthetic point of view. It was further required, in order to do away

FIG. 29. VOLUME OF TRAFFIC IN BERLIN, INCLUDING CITY AND BELT RAILWAYS, ELEVATED AND SUBWAY, SURFACE CAR AND OMNIBUS LINES

The width of Lines is in proportion to the respective volumes of Traffic

with monotony of effect, that no two stations should be of the same style of architecture.

After plans were finally accepted by the commission and portions of the road were actually completed, important changes were ordered to further satisfy public criticism.

For example, the Bülow Street Station, with its ornate iron work, massive stone terminals and well-studied grill-work, resulted. The heavy stone pillars take the place of original steel columns which were removed in compliance

with a strong public sentiment for something more pleasing to the eye.

The station itself is well worthy of remark, furnishing an interesting solution of the combination of stone and iron in a manner appropriate to both, especially noticeable in the adoption of acroteria at the peak of the gable and at each side, forming a gutter fully explained by the otherwise uninteresting leader pipes.

An especially successful combination of architecture and engineering is found in the Nollendorf Place Station, which marks the dividing line between the elevated and underground sections of the road. The station itself is a rather severe design of iron and glass, supported by massive stone pillars. Other stations along the elevated portions of the route are to be commended for their beauty and artistic treatment, mediæval in type to harmonize with surrounding buildings in certain locations, and always, even where there is no special architectural feature, the manner of the treatment of the steel columns is a tribute to the art of the engineer. A problem of an interesting nature is solved at the point where the elevated road crosses the Anhalter railroad bridge, which itself spans the Landwehr Canal.

Before construction began, experimental sections were put up, in order to test various forms of roadbed, with a view to adopting the type over which the trains could be operated with the least noise. Rubber and felt layers were tried, between ties and structure, and various hard woods were used for plates between ties and rails, all of which proved more or less unsatisfactory. Rails placed directly on the iron structure, or on ties, produced greater noise than when placed on wooden stringers. Pure lattice girder construction produced more noise than plate girder type. However, to erect pure plate girder construction in a city elevated road, where such a persistent demand for artistic effects is made, is practically out of the question. To reduce noise with the lattice type of construction, and to furnish at the same time a more satisfactory roadbed, the iron cross-beams surmounting the main girders are embedded

in concrete. The roadbed ballast consists of gravel. A more or less solid, noise-absorbing construction is thus produced, which approximates an embankment, the form of elevated construction in which there is the least noise. It becomes more of a rumble than a rattle and a screech.

Of interest in this connection, is the point where the elevated structure crosses the Landwehr Canal above mentioned. Here its course is through an old building, remodelled for the purpose. It was intended to utilize it for storage purposes after the erection of the road, but the noise problem was so successfully met, that it is occupied by tenants for dwelling purposes.

Much discussion prevailed at the time of the opening of the New York subway system and many complaints found vent in the columns of the daily press as to the unsightly kiosks of the system, several of which are not only inconveniently and dangerously situated, but are also the quintessence of ugliness.

Seemingly no consideration was given to the harmony of the surroundings, the stations reminding one of small barns rather than of structures forming parts of residential districts. Although European underground railways were already in operation at the time subways were proposed here, and a Subway commission had been sent to Europe for the purpose of studying the installations there, the public did not seem to profit by the pleasing designs of the foreign stations when our own came to be erected, such for example as those of the Buda-Pest subway.

The New York subway system has been held up as being the foremost in the world, but the well-informed portion of the public familiar with other systems is aware of its architectural inferiority, to say nothing of the inferior ventilation and service as compared with systems abroad.

As a means of connection between subways, terminals, bridges and the like, moving sidewalks are used with great advantage. They should be run in three parallel divisions at speeds of some three, six and nine miles an hour, enabling pedestrians to step from one platform to another without

ELEVATED RAILWAY STATION, SCHLESISCHES TOR, BERLIN

ELECTRIC ELEVATED RAILWAY, SCHÖNHAUSER ALLEE, BERLIN

The elevated structure is popularly known as Berlin's Umbrella. On the left is an example of the numerous advertising columns

BERLIN ELEVATED RAILWAY, BÜLOW STREET STATION

danger or inconvenience. Such sidewalks may either be provided with seats or left bare, for walking, as with the additional speed of walking, from eleven to twelve miles an hour can be made on the highest speeded platform.

Such platforms are highly useful, in fact a public necessity in certain places, for connecting terminals where it is not feasible to put in cars.

A highly important feature in laying out rapid transit lines is the convenient and quick transfer at stations and terminals to local transit lines. Such transfer should be made with as few steps as possible, and with the greatest ease and safety. This is a feature much neglected by rapid transit companies in America, long stretches of walking being necessary at terminals, greatly to the delay and inconvenience of the public.

Transportation in the leading cities of the world by rapid transit lines offers many interesting figures for comparison. While New York shows a higher charge and a greater number of passengers carried, the length of haul is also greater, while in comparing the figures, the purchasing power of money in the various places must be taken into consideration, as the 2.5 cents which is the average fare, for example, on the Paris Metropolitan system, has a much greater purchasing power than the same sum in New York, and is consequently a higher fare than appears from the face of the figures.

PASSENGERS PER CAR MILE IN THE LARGER CITIES OF THE WORLD

Rapid Transit Railways

Berlin Elevated Railway	8.0
Paris Metropolitan	8.0
Liverpool Elevated Railway	5.9
London (Central) Subway	4.9
New York Interborough Rapid Transit Co.	4.1
Vienna City Railway	2.8

AVERAGE FARE PER PASSENGER PER TRIP IN THE LARGER CITIES OF THE WORLD

Railway Systems	*Cents*
New York Interborough Rapid Transit Co.	5
Chicago Elevated Railway	5
London (Central) Subway Railway	3.7
Liverpool Elevated Railway	3.3
Buda-Pest Subway Railway	3.4
Berlin Elevated and Subway Railway	3.0
Vienna City Railway	2.8
Paris Metropolitan	2.5
Berlin City and Belt Railways	1.6

American city transit facilities are largely a patchwork of different lines, usually constructed in a haphazard manner without any regard to the convenience of the public in transferring from the cars of one system to those of another. In fact, the companies are usually antagonistic and do everything in their power to avoid co-operation, supposedly for their own gain. Such conditions are maintained at the expense of the public, and arise out of the fact that city transit is a game for private corporations, and that city administrations, holding office but for a brief period, are unable to develop the transit plan on any definite basis, necessarily proceeding by piecemeal from administration to administration. Without experience in engineering undertakings of such magnitude, or for that matter of any magnitude usually, they are unable to work out a properly designed system of interlinking traffic.

Contracts drawn up between cities and private corporations for transit facilities are too often examples of monumental incompetency in administration and engineering, and utterly lacking in foresight or any sense of the present or future needs of the cities. The principal object of the corporation appears to be to "tie the city up," and this is usually accomplished by contracts for long leases, full of loopholes for the company and disadvantages for the city and the public.

Such a condition is not only true in regard to traction

franchises but in every dealing which cities have with private corporations.

As indicated, the short tenure of office of officials in American cities is largely to blame for this condition, with the further circumstance that the office holders, usually not being large property holders, are not particularly interested in the welfare of the city as such. Their personal interests may thus very easily run counter to the interests of the city, and the city is thus badly represented in all its dealings with corporations.

In Germany a much better system prevails, politics being entirely eliminated and the governing of the city being placed in the hands of the "city fathers." They are selected on account of their large property holdings in the city. The city fathers as a class are men who command respect on account of their means, standing and ability, which is far from being the case with American aldermen, to whom it would be largely ridiculous to apply the term city fathers. The private interests of the German city fathers are thus identical with the city's interests, as any unfavorable bargains made by the city will affect their property unfavorably. In deals with corporations the German cities are thus properly represented, both as to the interest and as to the ability of their representatives, and they are not, therefore, betrayed at every turn as are American cities.

The German city fathers, having a real sense of responsibility of the city's interests, have the foresight to engage, in addition to the city's engineers, advisory engineers for unusual undertakings, so that the city has at all times the advantage of the highest technical skill, requisite not only in the construction of transit systems, but in the many other departments of the city's activities as well.

In the entire management of cities, the greater and more important problems are those of engineering, and it unfortunately too often happens in American cities that engineering undertakings are conducted by politicians or "city engineers" appointed for political reasons and with very limited experience.

In congested traffic districts and merchandise freight districts, underground highways or double-decked street could with great advantage be employed. Such underground highways could contain, in addition to tram cars for freight, wagonways and footways or moving sidewalks. A somewhat similar system, where it is desired to avoid excavation, would be a double-decked street, in which a complete street is built above the first street, in the form of an elevated structure. On the upper street could be handled light traffic and pedestrian traffic, and on the lower one, freight and heavy traffic.

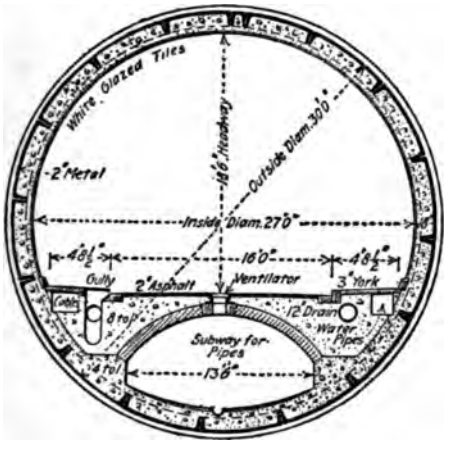


FIG. 30. SECTION OF THE ROTHERHITHE TUNNEL UNDER THE THAMES, LONDON, FOR PEDESTRIAN AND VEHICULAR TRAFFIC, WITH PIPE GALLERY

In many cases where it is impracticable or too expensive to span wide rivers with bridges, a feasible method of communication and one involving much less cost, is that in the form of tubes or tunnels, such as the Rotherhithe and Blackwell tunnels under the Thames. These tunnels are lighted and used just as streets and a great volume of traffic passes through them. Similar tubes are used under the Hudson for electric trains from New York to New Jersey towns, and additional tubes are in contemplation for vehicular traffic, owing to the difficulty of finding suitable foundations for bridges over the Hudson.

The proper distribution of vehicular traffic is a problem which demands consideration from the very outset of city planning. The presence of congestion at any point is the result of improper planning and nothing else. Either the streets are not wide enough or numerous enough, or the districts to and from which the traffic is passing are not properly laid out with reference to each other. Congestion

may be relieved by cutting through proper channels, giving traffic new directions, or by scattering the sources from which it arises.

Unlike street railways, which should all converge to a common point or be otherwise in communication so that transfers may be effected, the lines of vehicular traffic should be as much separated as possible, since the individual vehicles thus having more room, can make better speed, covering their journeys with a minimum of expense and inconvenience.

Vehicular traffic and street railway traffic should be planned to be kept apart as far as possible, and vehicular traffic should always be subjected to the strictest regulations.

Heavy trucks should be confined to certain streets and delivery wagons restricted to deliveries at certain hours. The use of the streets for cab stands should be restricted and trucks or automobiles of more than certain sizes subject to a heavy license tax, increasing rapidly with their bulk. Street cars should also be restricted in size in order to maintain a more frequent service.

Within the last year there has been put into operation in Hamburg an automatic system of calling public motors which seems to be giving general satisfaction. Thus far Hamburg is the only city in the world in which the system is in use.

Automatic machines, resembling externally letter boxes, have been placed at every vehicle stand in the city, and these machines are connected with a central office by an individual wire. Any one who desires to call a carriage and who finds none at the stand, places a 1-mark piece ($0.238) in the machine, whereupon his presence is indicated immediately at the central office, and the central office being already advised of the number and location of free vehicles at all other stands, immediately causes a motor to proceed to the waiting customer, who is credited with the 1 mark ($0.238) already paid into the machine when he settles for his fare.

The convenience of the public and the self-respect of citizens demands a suitable and dignified street nomencla-

ture. Trivial and commonplace street names should be avoided, since the householder gains no prestige through living on a street so named. On the other hand, the naming of the streets should not be carried out in too high-sounding a manner, especially in suburbs, but names looming in prominence in about the proportion of the prominence of the street should be selected.

The custom of naming streets and avenues by numbers, while of a certain convenience in very large cities, is monotonous and uninteresting. Naming streets by letters of the alphabet is even worse. The city of Washington is particularly afflicted in this respect, since the names carry as appendages, letters indicating the geographical location of the streets. Salt Lake has an equally pestiferous method of indicating street locations.

Where a number of similar streets of a gridiron plan are to be named, a good system to indicate their succession without naming them by numbers would be to give them names, the initial letters of which would by their alphabetic order indicate the location. With a hundred streets to be named, the first four would be named with names beginning with the letter A, as Abbott, Allen, Arkwright and Atchison. These would be followed by four streets beginning with B, and so on, the general location of the streets thus being ascertainable by the alphabetic initial. The second letter of the name would indicate the divisions in the letters of the alphabet, Allen Street thus coming before Arkwright Street.

American cities have even acquired almost a habit in the use of certain names for streets. Perhaps the worst is Main Street, a name which abounds in great numbers. Market Street is a close competitor, while Springs, Broads, Broadways and High Streets flourish. Some cities name their streets after the various states in the Union, which may be complimentary but is certainly without much other meaning.

The naming of a street is of much more importance than is usually understood, as it has a considerable psychological

NOLLENDORF PLAZA STATION OF BERLIN ELEVATED RAILROAD

KIOSK OF BUDA–PEST SUBWAY

Examples of massive and artistically designed structures which prove attractive additions to a city's appearance

RING STREET AND VOTIV CHURCH, VIENNA

A center of electric traction with lines reaching many suburbs. When the lines were municipalized all horse cars were discontinued

effect. A street name full of dignity or of a unique character often makes a street famous, which would otherwise be lost in obscurity. A street of prominence, however, may often overcome the handicap of its name and cause the name to have a meaning far greater than the words import. Thus Fifth Avenue in New York, though possessing a name in itself of the most commonplace nature, has given to its name a considerable significance. No street, however, named by a letter of the alphabet alone has ever made itself famous, the nearest perhaps being Avenue A of New York, a notably mean street, and the same is true of streets named by numbers, although a numbered street may acquire a certain value, just as numbers used for trade-marks lose their significance as numbers and become units of identification.

CHAPTER X

OPEN SQUARES AND TRAFFIC REGULATIONS

Traffic Distributing Squares; Transportation Terminal Spaces; Market Squares; Public Meeting Places; Ornamental and Floral Squares; Forecourts of Public Buildings and Entrance Spaces

THROUGHOUT a city there should be at suitable locations, open squares or places secondary in importance to civic centers, but supplementing and relieving the civic centers and other centers described.

Such open spaces should include:—Traffic distributing squares; transportation terminal spaces; market squares; public meeting places; ornamental and floral squares; forecourts of public buildings and entrance spaces.

Open spaces or squares have been a feature of cities since the earliest times. In Greek cities such an open square was called an agora and in Roman cities a forum. In the latter it was often an enlargement at the intersection of the main north and south street and the main east and west street, and arches were placed at the entrances.

Such squares were used for various purposes, as for public assemblies, and making of law, dispensation of justice, marketing, and public games. Aristotle objected to the various uses of the agora and advocated its restriction to public purposes and the display of works of art, with separate squares for market places.

Such a separation was followed in Rome where certain squares were for assemblies and debates and others for markets, as the forum boarium for cattle, the piscarium for fish, the olitorium for vegetables and the coquinium for ready-cooked vegetables, which was perhaps the forerunner of the modern delicatessen shop.

The necessity of public squares for purposes of assembly is very much less in modern times than it was in former ages, since our methods of elections, judicial procedure, reference of questions to committees, voting in small polling units and particularly the invention of newspapers, render assembling unnecessary for many of the purposes which brought the public of ancient cities together.

On the other hand, however, our improvements in transportation by wheeled vehicles have been so greatly advanced and great volumes of traffic are so much in evidence that we need open spaces for purposes and in places not required by the ancients.

In a modern city, a single place of public assemblage in the open, for occasional parades or meetings, is sufficient, but every city should be supplied with numerous open spaces designed to accommodate traffic and to serve to distribute it in the most expeditious manner.

Open squares take several forms, the principal ones being the square, the circle, the oval, the rectangle, the triangle, and the irregularly shaped plot, each of which has its own characteristics.

In the laying out of such open spaces the volume of traffic and the character and uses of the buildings should be taken into consideration. If the square is to be surrounded by public buildings of a uniform style, it may be made formal in plan, but if the character of the buildings cannot be controlled, a formally laid out space is likely to be much less effective than one which has the charm of irregularity. A form of open space which proves of great interest and effectiveness is that which is somewhat irregular in form, but generally rectangular in plan. Picturesque examples of such forms of squares are found in many European cities. The square is made extremely individual in character if it is entirely enclosed in a frame of buildings. This appearance may be contributed to by leading the streets into it at angles and by not having it crossed by the direct line of street. This tangental form of street entrance to the square produces a form of circula-

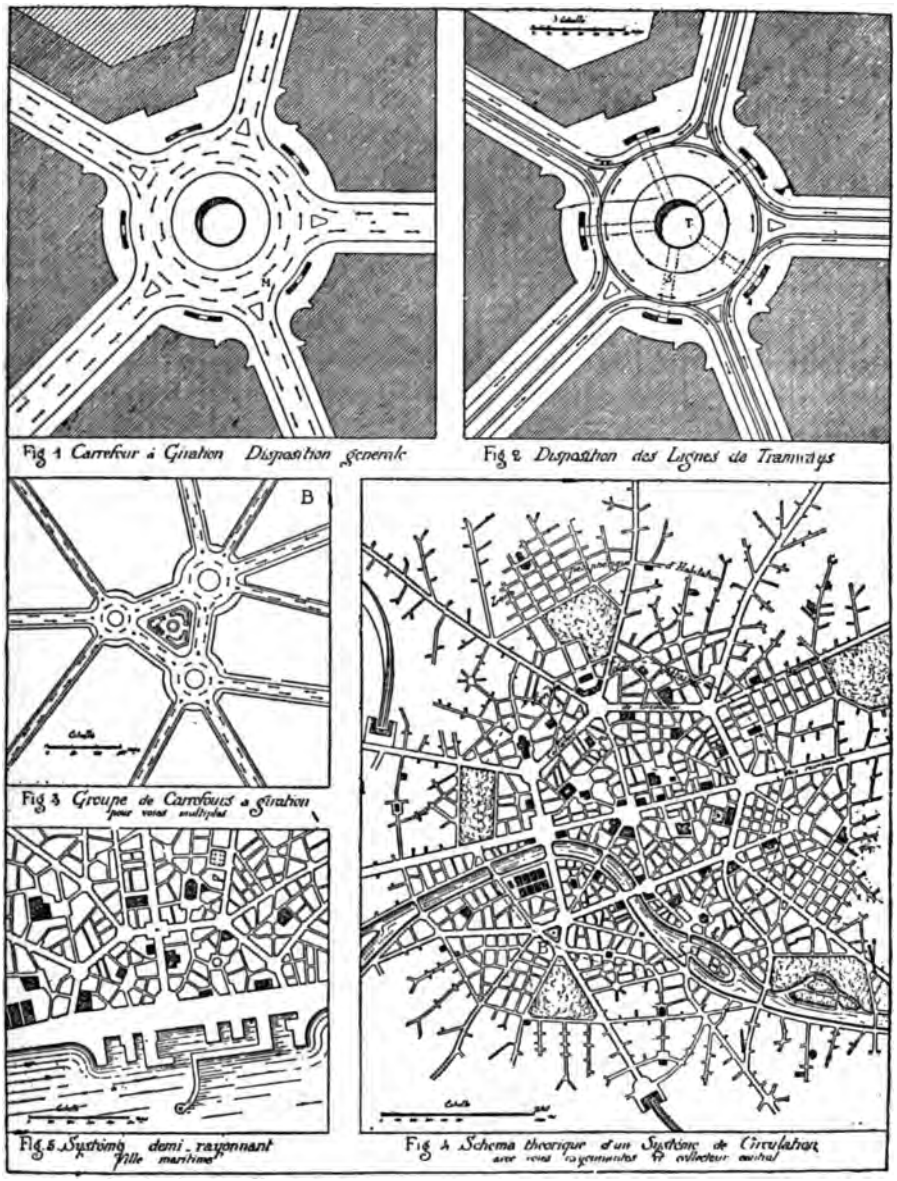


Fig 1 Carrefour à Giration Disposition générale
Fig 2 Disposition des Lignes de Tramways
B
Fig 3 Groupe de Carrefours à Giration pour voies multiples
Fig 5 Système demi-rayonnant Ville maritime
Fig 4 Schema théorique d'un Système de Circulation avec voies rayonnantes et collecteur central

FIGS. 31 TO 35. PLANS SHOWING DIFFERENT METHODS OF SOLVING THE PROBLEM OF CONGESTED STREET TRAFFIC

tion of traffic described as turbinal or like a turbine, for there is no traffic directly across the square at any point. All the streets running into the square have the advantage of architectural focal points, and traffic through them is readily distributed in the square without undue congestion at any one point.

An open space of such an oblong character proves highly desirable as an approach to a large building, while the build-

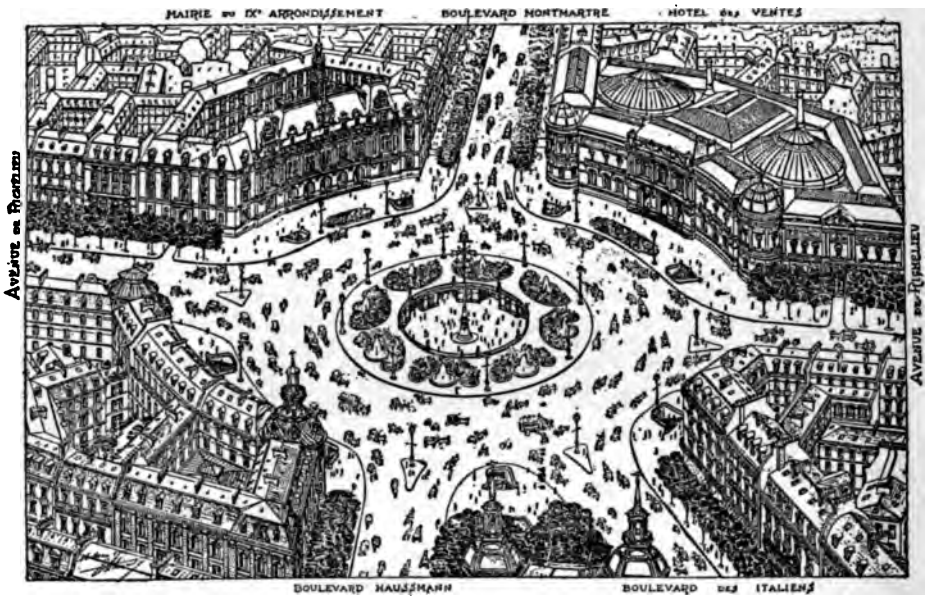


FIG. 36. PLAN SHOWING UNDERGROUND STREET CROSSING FOR PEDESTRIANS AT A CENTER OF CONGESTED TRAFFIC

ing in turn gives effect to the square, since proper distance is afforded whereby the building may be viewed, which, if had in a space of circular form or square form, would be likely to make the square too large in area.

Where traffic is heavy and a square of large extent is desired, the circular form may be employed with streets leading into it in the form of the spokes of a wheel. Such a space if surrounded by an outer concentric circular street may be designed to handle a very large traffic, as much of the traffic is diverted by the outer street and never enters the inner circle. A circular space is open to the objection

that the surrounding structures have an inconvenient façade line and pedestrian traffic must walk around or risk the traffic, which converging from so many directions is confusing and dangerous.

This form of traffic center may be expanded with advantage in some cases by making the outer street one of great width, in fact a large ring, with the central portion occupied by monumental buildings instead of being an open space.

An oblong form of square, with semi-circular ends and parallel sides, has many of the advantages of the rectangular form.

An open square which is an exact square in shape is not particularly desirable, as its uniformity and severity are destructive of interesting effects and from a traffic point of view it has no particular advantage, especially if it is entered by streets from the middle of the sides. Such a square, however, if entered by streets only at the corners is likely to be more effective, particularly if only one street enters at the corner and not two approaching at an angle, as the entrance of two streets so opens the corner of the square as to destroy the effect of individuality and enclosure. The corner of a square at which a street enters may often be improved by closing the corner with buildings, leaving an arched opening for the street.

Squares should not be too small in size or too large, although there is small danger of their being made too large. Sitte recommends that an oblong square should be as wide as the height of the principal structure facing it and twice as long, a rule which has much to recommend it.

Various considerations will determine the size of a square but it should always be made of sufficient size.

For example, the Place de la Nation, Paris, is a circle which has a diameter from building line to building line of 825 feet, but this is a place having an outer ring street which is included in the dimension. The inner ring street is 80 feet in width. The principal thoroughfares enter the square.

AUGUSTUS SQUARE WITH MENDE FOUNTAIN AND NEW THEATER, LEIPZIG

PLAZA DEL POPOLO DAL PINCIO, ROME

A well located and effective focal point with St. Peter's in the distance

FRIEDRICH'S PLAZA, MANNHEIM
Showing ornamental water tower and fountains

FRANZENS RING, VIENNA
Justice Palace, University and Votive Church

The Place de la Republic is an irregular rectangle 350 feet wide and 975 feet long from building line to building line, with three thoroughfares entering at one end, two at the other and one on each side, with five minor streets entering at the points of juncture of the principal streets.

The Place Royale, Paris, is exactly square in plan, 455 feet on a side, with streets entering at sides, and was laid out by Henry IV in the early part of the seventeenth century.

In its design as a point of intersection and distribution of traffic, an open space should be closely adapted to the uses to which it is to be put. The arrangement of entering streets and the intersections of car tracks and lines of traffic should be such as to automatically reduce transportation to the simplest possible movements and the fewest number of intersections. It should also be designed so that traffic regulations may be effected with the least resistance.

The degree of confusion which may arise in traffic converging into a square may be appreciated by noting the number of points of intersections. Where two streets cross at right angles with a line of traffic on each side of each street, four points of intersection exist for vehicles which continue in a straight line, but if the vehicles may turn the corners in the most direct manner, there are sixteen points of intersection, or points at which collisions might occur. But if instead of four streets thus branching, five branch off from a single point, fifty points of intersection are produced, while if six streets branch off, produced by the intersection at a single point of three streets crossing, one hundred and twenty points of intersection occur.

Consequently, any large volume of traffic unregulated in such a square would be in a constant state of confusion.

The most effective method of regulation is that which requires all vehicles, on entering the square, to turn to the right, and continue, not across, but around the square to the street where they leave, even if this compels an almost complete traversing of the whole periphery. This method avoids all intersections and produces the turbinal form of traffic circulation, which was produced to a large extent

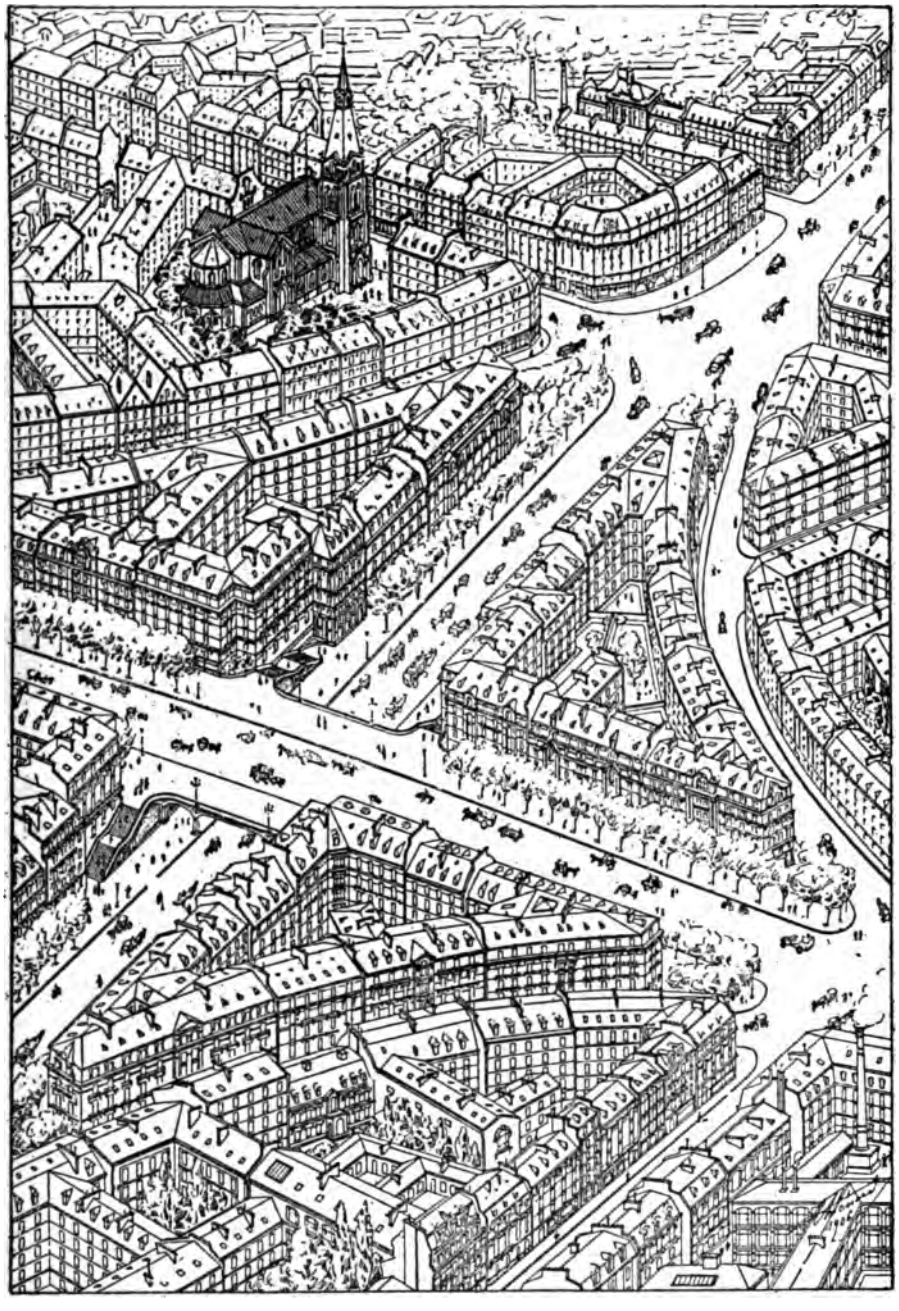


FIG. 37. PROPOSED DESIGN FOR A SUPER-IMPOSED STREET INTERSECTION

A Plan which should prove of great service to many American cities

automatically in cities of earlier times by the tangental entrance of streets as described.

It is often undesirable to place a large monument in the center of a square, or to encumber the open space with trees, high ornamental fences or shrubbery, and it is usually more desirable to place the monument at the end of the square where it will not obstruct the vision of those crossing and where it may be viewed to better advantage. It should be so placed that it will serve as a focal point of converging streets and thus be utilized to produce the most favorable effects. Minor obstructions in the line of traffic should be avoided.

In order to deflect traffic into the most desirable channels, low safety isles should be built. A height of curbing of four inches will usually be sufficient, and this will not prove an impediment to pedestrian traffic.

Transportation Terminal Spaces should be roomy and so laid out that the traveller may, at a glance, find his way to the various means of local transit, with no confusion or the asking of questions.

Street car lines should approach the station in such a way as to afford the greatest facilities and convenience, and cab, bus and baggage wagon lines should be placed so as not to interfere with other traffic and yet to be easily accessible.

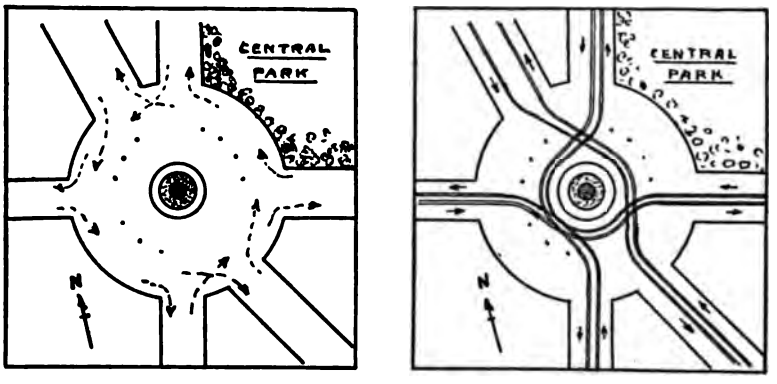
Cities should approve the design of railroad stations, and so arrange the approach of local transit facilities that the enormously long walks so often encountered, as noted, in reaching trains, may be obviated.

The considerations that govern railroad stations are equally important for docks and landing piers, which are too often placed in the most inconvenient locations.

An effective arrangement for the approach of a railroad station which affords both ample traffic facilities and a proper perspective for the structure, is that of a semi-circular forecourt or space into which the transportation lines run and around which the cab stands are placed. German railroad stations afford many examples of effective,

arrangements, which may be studied with advantage by civic designers.

Market squares are an essential part of a city's design, for they afford a meeting place for the consumer and the small country producer. In former years such open market squares were much more in evidence in American cities than at present, but with the increase in prosperity, the convenience of the corner grocery caused their decline. Now that



FIGS. 38 AND 39. TRAFFIC REGULATION AT COLUMBUS CIRCLE, NEW YORK

Left Hand Figure showing Course of Vehicles; Right Hand that of Street Railways. Circle of dots shows position of portable rope holders

the high cost of living necessitates the closest domestic economies, their value is better appreciated and they are growing rapidly in favor.

Such squares should be placed in proximity to the residential districts whose inhabitants require marketing facilities, and at the same time as conveniently as possible to main thoroughfares and railroad depots. Markets for staple products may be arranged in open spaces with wagons in rows, or protected under open sheds, while market houses should be provided for more perishable products. The staple markets may be open only twice or three times a week, though the market houses should be open daily.

Market houses which are placed in blocks should have an inner court for delivery wagons, so that the streets will not be blocked up.

Public meeting places should be provided for political and other public meetings. These should be open spaces, not devoted to park purposes but adapted for large assemblies, thus keeping bodies, such as strikers or others, away from points where disturbances are likely to be created.

Such meeting places afford facilities for the congregation of the public on necessary occasions to listen to addresses and review parades. Permanent grandstands may be incorporated. Such squares would also serve as breathing places, and as playgrounds for certain games for children. They could also be provided with band stands for public concerts.

Abroad such public squares are often occupied on Sunday for a half an hour or an hour at noon after church services are over by military bands, at the change of guard, for concerts, the public promenading through the square to the strains of the music, which adds to the attraction of the day.

Such squares as well as those around churches and most other open squares are surrounded by fine residences, so that the most effective architectural setting is provided.

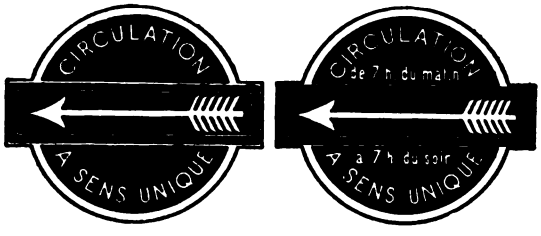
The appearance of a city may be greatly embellished by the proper treatment of small spaces and odd corners such as are often produced in the city's plan by large improvements.

Such spaces may be made ornamental by the placing of monuments, small structures, fountains, geysers, tasteful kiosks and advertising columns. They may also be filled with flower beds, shrubbery, or small trees, and utilized for structures of a convenient nature, such as well-designed news stands, lunch counters, milk stations, meteorological columns, underground public comfort stations, and street car transfer shelters.

Most public buildings in American cities, though often imposing in themselves, are as a rule placed in locations of little advantage. Enormous sums of money are spent in the buildings, but the approaches are such as to seriously detract from their effects. In many cases a much better effect would have been produced had the structures been boldly placed directly in and across the street, or covering the intersections

of streets, thus breaking up the monotony of long stretches and affording striking focal points, sufficient space being left surrounding the structure for approaches and traffic.

An example of a great building badly placed is that of the New York Public Library on Fifth Avenue between Fortieth and Forty-second Streets. Had the building been placed in the middle of the rectangle which its site forms with Bryant Square at the rear, instead of so near Fifth Avenue, a vastly more effective result would have been achieved and the front



FIGS. 40 AND 41. SIGNS FOR ONE-WAY TRAFFIC STREETS USED IN PARIS

would have had the approach which the rear of the building now enjoys, but which serves no useful purpose.

Another building badly placed is the New York Post Office building on Eighth Avenue between Thirty-first and Thirty-third Streets, which though it has a façade of great magnificence, enjoys nothing but an outlook upon the rear of the Pennsylvania Station. Had the latter been properly designed in co-ordination with the Post Office, a place of great effect would have resulted. Both of these buildings are badly located and their architectural grandeur is diminished by the surroundings and approaches. Had this station been placed on Park Avenue, within a few blocks of Grand Central Station, and connected with a concourse, a great traffic center would have been developed and the entire group of buildings would have supported each other, besides being more centrally located and more convenient for the public.

Such disregard of civic improvement is chargeable to the city administration, which should not permit any developments out of harmony with its general plan.

CHAPTER XI

PARK SYSTEMS

Location of Parks; Small, Central and Rural Parks; Floral Parks and Gardens; Communal Ownership Parks; Athletic and Play Grounds

AMERICAN cities, as a rule, are not sufficiently appreciative of the necessity and desirability of adequate park systems. They are usually satisfied with a few meagre, dust-covered squares, scattered in the business section, and certain large acreages in inaccessible locations, principally useful for athletic and picnic parties.

The park system of a city, however, should receive the same care and attention in its design and execution as is given to the civic centers and other portions of the city. It should be laid out in a broad spirit and with liberality, and space should not be spared. In the growth of a city, a thousand excuses will be advanced for encroachments on parks, and should they be found to be planned on too large a scale, it will always be found easy to reduce their size, while increases can never be accomplished except at large expense.

There is, however, small danger of planning parks on too large a scale, and there are few if any instances of cities ever having reduced the sizes of parks, once laid out. At one time, there was considerable criticism of the size of Central Park in New York, which is two and one half miles long and half a mile wide, but to-day even the proposal to erect in it a building of the most artistic character is vigorously opposed and public opinion would not countenance the slightest reduction in its area.

The park system of a city should be laid out in a systematic manner and should consist of parks of varying sizes

and design, each more or less particularly adapted for certain purposes.

In a general way, the parks should increase in size with the increase in distance from the business center, and there should be four or five classes of parks.

Those of the smallest class should be located in the most congested portions of the city, to relieve the pressure of business, but they should not be so large as to have a disorganizing effect or cause undue inconvenience to traffic and the despatch of business.

Parks of the next largest size should be in the crowded residential and tenement districts, and they may be of varying sizes, from one to four blocks or more in area.

Parks of the third class should be located on the outskirts of the residential portions and may be of large extent, from twenty to several hundred acres in extent. These should be the principal parks of the city and should be connected by boulevards and parkways.

The fourth and largest group of parks may properly consist of large undeveloped areas of land, purchased by the city and rented out partially, for farming uses and partially held as forests, from which the wood may be cut and sold in such quantities as will not deplete its growth.

From lands such as these, cities in Germany and other European countries derive large and increasing revenues, while portions of the land may be sold from time to time as the city grows.

For example, the city of Berlin has been laid out and its development planned up to the year 2000, when it is estimated the city will have 10,000,000 inhabitants.

Berlin has a population now of 4,000,000, being the third largest city in the world. Before its suburbs, the principal of which are Charlottenburg, Schoneberg, Rixdorf and Wilmersdorf, were incorporated with it, its population was 2,091,000 and the area of its parks was as follows:

Nine parks, covering 776 acres; 147 small decorative plats, 254 acres; 3 tree nurseries, 42 acres; 1 school garden, 74 acres; a total of 1,146 acres.

BRANDERBURGER GATE, BERLIN

Focal point at the junction of the Tiergarten and Unter den Linden

AVENUE OF VICTORY, BERLIN

Flanked on both sides by thirty-two marble statues of Prussian rulers

THE GRAND TERRACE, SANSSOUCI, POTSDAM
Erected by Frederick the Great

THE WILHELMA, CANSTADT
A hall in Moorish style with highly formal floral gardens

Trees are planted on 296 streets of a combined length of 106 miles. Around the trees are 262 garden plots having an aggregate area of 237 acres. For children's playgrounds there are 99 acres of grass plots, ranging from 1¼ to 17 acres each, 75 acres of other plots ranging from 360 square yards to 2½ acres each, and 66 "sand piles," ranging from 25 to 950 square yards each (aggregate area about 173 acres). The sand piles are provided with 56 play tables and 18 shelter roofs.

The park area of Charlottenburg (population 309,400) on March 31, 1912, was 618 acres. The total area of the city on the same date was 5,790 acres. In addition to its parks proper the city maintains four tree nurseries in which 174,000 young trees were growing at the end of March, 1912. At the same time the municipal greenhouses contained 87,885 flowering plants, 1,399 palms, and 2,408 decorative plants of an aggregate value of $10,460. In the course of the year 456,643 plants worth $27,000 were used in the parks, in the street boulevarding, and about schools, hospitals, etc.

Berlin-Schoneberg possesses its own municipal gardens, covering 50,000 square yards, and when entirely completed will embrace 11 greenhouses, 125 hotbeds, a botanical section for providing schools with demonstration specimens, and a municipal tree nursery.

On the average 300,000 plants, including about 50,000 bulbs, are used each year for setting out in the city flower beds. The park commission's budget for the fiscal year 1913-14 amounts to $72,195.

Other cities in Germany derive large revenues from their lands, some owning from 10,000 to 40,000 acres in the city limits. Some of the German cities, instead of collecting taxes, pay their citizens dividends each year, out of the profits derived from lands and public utilities owned.

The system of parks should thus be laid out in the most comprehensive manner and with a long view into the future, and the city should not hesitate to acquire ample lands for all possible park purposes, since such lands near a growing

city will never decrease in value and are bound to prove large sources of revenue in one form or another.

In the planning of a park system, many important considerations must be taken into account, among which are, in addition to the ample sizing of the parks, their number, their proper locations, the nature of the land to be utilized, their organization into a system, their relation to waterways and boulevards, the purposes for which they are to be utilized, their environment, their accessibility and their internal design.

The latter depends on size, location and uses, and may be either of a formal or a rural character or a composite.

The number of the parks of a city should be large, particularly as regards the smaller parks, and an important principle of park design is to have the number and location such that every portion of the city is within easy walking distance of at least a small park.

In location, parks should be so placed as to be part of a system, and not merely set down at haphazard and wherever room may be made. They afford excellent terminal points for streets and avenues, and when organized into a proper system add unity and variety to a city's plan.

The larger parks should, as noted, be connected by boulevards, and may often have waterway connections, either for pleasure purposes or commercial use. Commercial waterways, indeed, should usually be laid out with grass plots and lined with boulevards, as is frequently done abroad.

Land best adapted for park purposes is often of the smallest value for other purposes. Steep hills, cliffs or rock formations, swamps, ponds, lakes and streams render land expensive of utilization for building purposes, but supply the natural features most easily transformed into interesting parks.

A striking example of the use of cliffs and steep hills for park purposes is seen in Morningside Park and Mount Morris Park in New York. Morningside Park is a long, high cliff or bluff, largely covered with trees, vines and other vegetation, while Mount Morris Park contains a steep, round hill. Both are popular parks.

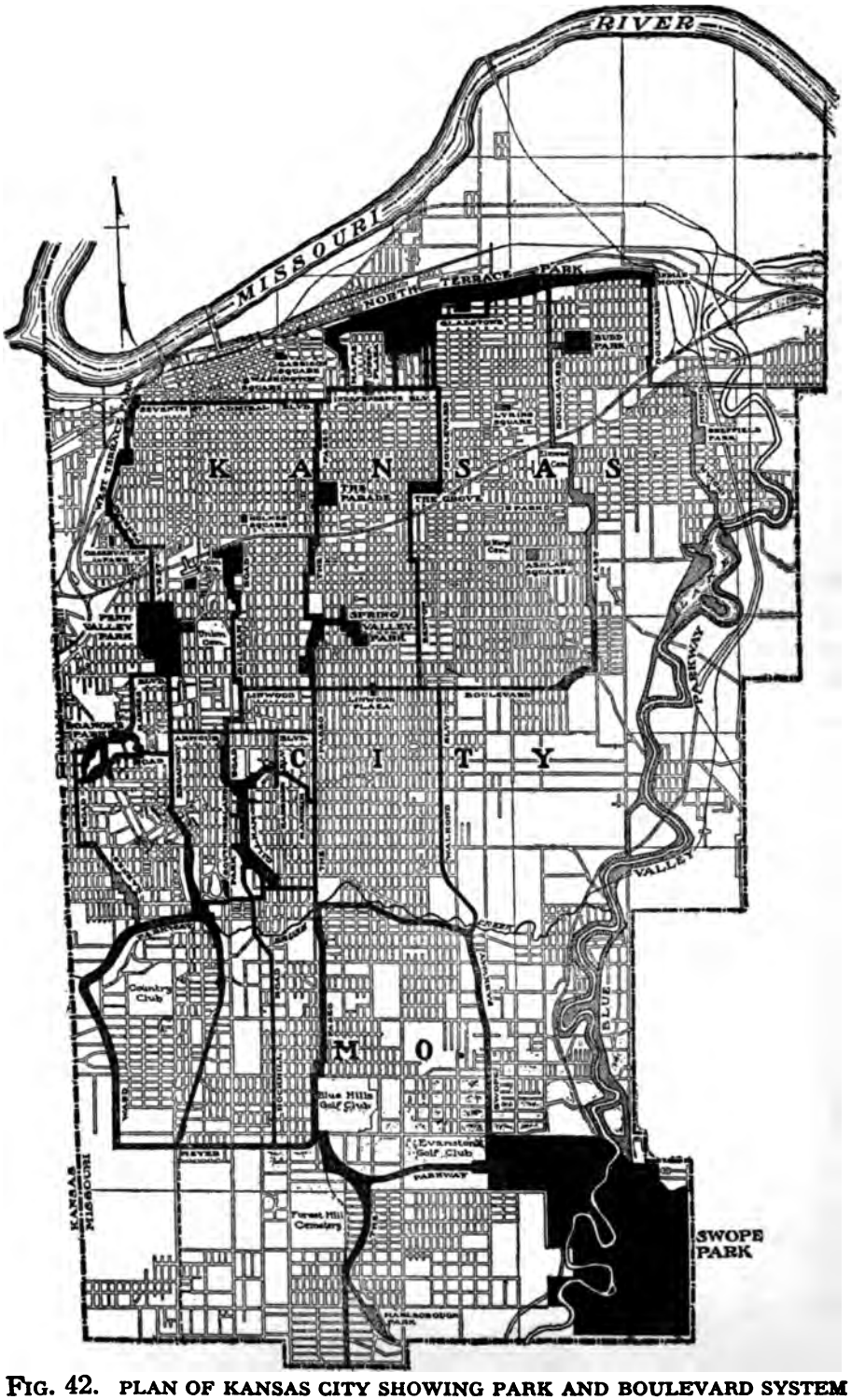


FIG. 42. PLAN OF KANSAS CITY SHOWING PARK AND BOULEVARD SYSTEM

Small parks in congested regions are properly of the greatest variety, ranging from those of a formal nature to open spaces with little or no vegetation or children's playgrounds fitted with swings and other apparatus for play.

The environment of parks is also a determining factor in their design. It is the custom to a large extent in European cities to place public buildings adjacent to parks, thus affording distance for the viewing of the buildings, and determining for such parks the nature of their design. Parks not so surrounded by features of architectural interest will be of a different design.

Small parks, squares and playgrounds should always be constructed so that each has its own individuality. This may be attained by different forms of architecture and landscape treatment, by bodies of water, fountains, statues, sunken gardens, terraces and other forms of construction and embellishment. Many such small squares in European cities gain in effect through being almost wholly enclosed, being penetrated by streets in only one or two places and not at the corners, where the buildings meet. The intimate effect of a large court is thus gained, which gives an unusual degree of individuality to the square.

In addition to the small public parks of a city abroad, are often found numerous small private gardens, which though not open to the public are interesting features of the townscape.

Such private gardens are numerous in Moscow, where, however, they are mostly surrounded by high walls, and are thus of less interest than when without such enclosures.

Gramercy Park, which occupies a small block in the old Knickerbocker section of the city of New York, is a unique example of a private park, as the land belongs in common to the owners of the surrounding houses, and the park is not open to the public, being protected by a high iron fence. Access is had by keys belonging to the householders, and a certain sum is assessed against the property owners by the committee in charge, for the maintenance of the park. Though small, this park has been a strong factor in the

deflection of the business invasion from this section of the city, and has enhanced the value of the surrounding property perhaps, in the case of each plot, to more than its own original cost.

It is a form of park which could be adopted with advantage by property owners in residential sections of many cities, since the element of exclusiveness adds greatly to its value.

Small parks may be either of a strictly formal nature, or laid out on a more or less rural plan, with cascades, flower beds and an abundance of trees. Running water is always a feature of interest, but stagnant water should not be permitted, being a breeding place for mosquitoes which are likely to become a great nuisance.

Where the population is congested, as in tenement districts, a considerable portion of the small parks may be devoted to playgrounds with apparatus of different kinds, such as swings, see-saws, parallel bars and the like, for the use of children at play, not omitting shallow wading pools, sand piles and artificial cascades. Such parks thus have the greatest possible degree of usefulness.

In large cities, one of the drawbacks to parks consists of the large number of men out of employment and frequently of a trampish nature who lounge and doze on the park benches during both the day and the night, making the parks unattractive to the other visitors. Such men, having nowhere else to go, cannot be kept out of the parks.

In order to clear the parks of them, a plan might be tried of erecting free barracks in certain portions of parks or on vacant lots, such barracks being merely open sheds, screened by hedges, and fitted with slatted wooden bunks in tiers; at the end of the bunk, a wooden form for a pillow, the wayfarer folding his coat for the purpose. Here he could snooze the whole summer long without making himself an eyesore to the public. The comforts of such a bunk would not be so great as to encourage the profession of tramping, while many a man out of work would be well served with a night's rest free. During the day, the shade and free cir-

culation of air would invite the leisure class in from the park benches, where they would be much better subject to police regulation and control. Should the guests of the free barracks demand it, a safe might be provided for the storage of valuables, though this is a detail which may be left to the discretion of the future.

Such barracks should be low structures and might be in rows, with the sheds in the form of gable roofs, a tier of bunks on either side of the central partition. Attendants in the parks seeing loungers of a certain class would direct them to the barracks, where, however, they would be likely to gravitate of their own account. The barracks, being screened on all sides with hedges, would afford the loungers not only a place in which to stow themselves away, perhaps on occasions for the last time, but would serve as ornamental features of the park landscape, for if placed on the sides of small parks, shutting off the view of the street, or in corners in clumps of trees, a more individual effect would be given the park.

Most large foreign cities are abundantly supplied with small parks. Berlin has a large number, as has Vienna, but in the latter city there is an arrangement known as the "Ring" which adds to the effectiveness of the parks. Dresden and Stockholm also have a large number of small parks.

In some foreign cities, there are large spacious squares, which though without grass, shrubbery or trees, still have, to a certain extent, the effect of parks, being embellished with fountains, obelisks, monuments, electroliers, etc.

The Place de la Concorde, Paris, which, however, is bounded on two sides by parks, is one of the squares of this type, while others are the Raadhus-Plads in Copenhagen, the eastern end of Unter den Linden in Berlin, the Dam in Amsterdam, and the Place de l'Hôtel de Ville in Paris. Owing to the traffic passing through them, they are necessarily open.

If the space, however, is too large, it has the effect of dwarfing the surrounding buildings. Such squares are found in Moscow and St. Petersburg in the Place Dvortsory, the

PALM GARDEN, FRANKFORT-ON-THE-MAIN

A semi-rural effect is secured by absence of railings and pavements

CONCERT SALON OF THE GARDEN SOCIETY, GOTENBURG

A typical example of a building and grounds designed for concerts, recreation and refreshments at small expense

COURT GARDEN AND ALLEE, DÜSSELDORF

Place Krasnaia and the Place des Theatres, which are merely large open spaces paved with cobblestones. While these spaces could have been laid out as parks with trees and grass plots, it may be that they have remained as open spaces for possible military operations.

Among the locations for parks which usually offer good opportunities for interesting effects are those along rivers and on islands. Cemeteries, are, to a certain extent, a part of the park system of a city, and they should be planned accordingly. It often happens that the cemetery of to-day is the park of subsequent generations. In New York, for example, two potter's fields of by-gone days are now among the most valuable of the city's parks.

One of the most important features of a park system is accessibility. The greatest attention should be paid to so arranging the parks and transportation lines that the public may be provided with quick, cheap and convenient means of getting to the parks, for otherwise they lose the greater part of their usefulness.

Every city should have at least one large park within easy walking distance of a considerable part of its population, and its other parks should be within easy reach by surface or other lines of transportation at a single fare. River and island parks should be reached by bridges or by boats operated by the city. If transportation facilities to the parks are not ample they should quickly be made so. The greater part of a city's population labors six days a week, with but few opportunities of recreation other than on the seventh day, so that every effort should be made to afford, on that day, all possible facilities for the needed recreation.

In character, the parks of a city should be varied, those of small size, surrounded by buildings of architectural interest, as has been noted, should be of a more formal character, that is, laid out on a regular plan, with walks, terraces, avenues, lakes, fountains, flower beds, statuary, ornamental electroliers and other features of a similar sort, than those situated in more distant portions of the city. The latter

should preferably be of a more rural character, primeval and undisturbed in general effect.

The main park of the city may partake of both these characteristics, portions being adapted for one purpose and portions for another.

Appealing to a large class of users, it should therefore contain a number of features calculated to make it an interesting place of recreation.

The entrances to such a park may be of a monumental character and there may be in it a central mall, laid out in a formal manner and flanked with statues. Promenades and walks, large flower beds, botanical gardens, zoological gardens, lakes, with aquatic birds, facilities for rowing in summer and for skating in winter; artificial geysers, small streams and rivers with artificial falls, rock formations, bypaths, music stands, summer houses, shelter houses, drinking fountains, refreshment stands, concert pavilions, tennis and croquet grounds, wading pools for children, playgrounds with swings, carousels and the like, sun-dials, ornamental bridges, free singing birds, squirrels and other small animals, driveways, bridle paths, reservoirs, observation towers, decorative kiosks and other features all go to make such a park attractive to visitors of all classes.

An additional feature, which is very popular abroad, particularly in Germany and Austria, and which could be introduced by American cities in their parks, though until its advantages became familiar, it would probably excite some opposition, is that of concerts to which an admission is charged.

Such concerts are given by orchestras of the finest musicians and are held in hedged enclosures. The admission fees serve to pay a large part of the expenses of the park, and also to exclude the rougher element of park visitors, such as young rowdies with baseball bats, unruly youngsters and the like.

The visitors to such concerts may also be served with refreshments, and between numbers of the program may promenade about. Such concerts are held on Sunday during

the afternoon and evening, and occasionally during the week, and many visitors remain to both concerts. Since a restaurant, serving a limited menu, is run in connection with the concerts, the time may be agreeably spent. The meals are served in the open air, but in case of bad weather the concert is conducted in a large concert hall in the garden, in which the meals are also served. In the evening the whole garden is illuminated with Chinese lanterns and electric lamps, which add to the picturesqueness of the scene.

Another feature of the continental park system which is of the greatest usefulness and which undoubtedly adds to the healthfulness of the public by making the parks and excursion grounds more attractive, is that of having on sale, wherever the demand may exist, adequate supplies of good food at prices to suit the pocketbooks of all.

It is entirely unnecessary to take baskets and boxes of food along, except where the most remote localities are to be visited, for wherever it is the custom for visitors to go on Sunday or in the evening, whether to the main parks of the city or to outlying parks, beaches or excursion grounds, restaurants will be found. At such places, if the visitor be inclined, bread, meat, beer, cheese, milk, coffee and other simple foods of the best quality may be had at very little more than city prices, and are purchasable in semi-bulk form, much as if the purchases were made at a city delicatessen. A whole party may thus obtain all the edibles they require at such moderate prices that the carrying of lunch baskets is superfluous. This does away with the scattering of papers and rubbish, which give American recreation grounds such an unattractive appearance. For those who have more to spend, restaurants of a more elaborate character are provided, so that however simple or reluctant the taste of the visitor, he may find adequate means of satisfying it wherever he goes. Very often the same restaurant supplies on different sides, or in different gardens, both the elaborate and the simple fare, the more expensive garden usually being on a par with the best city restaurants.

Only the smaller and more remote garden or park restaurants of this character are without music, while all the others offer exceptionally good music, frequently fine military bands of reputation. The grounds and parks in which such open-air restaurants are placed, are so laid out that attractive promenades may be enjoyed and the entire day may with enjoyment be spent in such a locality.

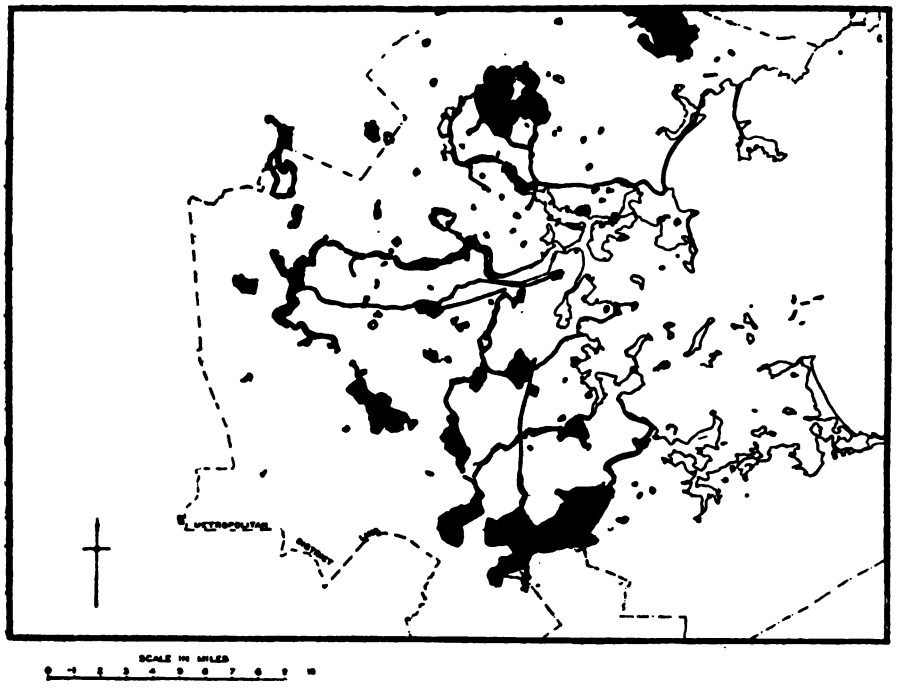


FIG. 43. PARKS AND BOULEVARDS OF BOSTON (POPULATION 735,000)

Compare with the uniformly arranged Parking system of Berlin, opposite

Objections may be offered to such a plan as this as not being applicable to American conditions, owing to the inclination of many to pretend to be able to spend more than they can really afford to on a holiday. More probably, however, the reason why such open-air restaurants have not appeared is that their proprietors have always attempted to charge all classes of visitors on a high-class basis, and the average visitor has thus learned by painful experience to take the lunch box along or stay at home.

Classification of restaurant prices, however, is not found objectionable when properly applied. In many of the best hotels, the same food served in the restaurant, grill and café commands different prices in each. Properly managed, such classified open-air restaurants would prove highly popular, and would cause parks to be used to a far greater extent

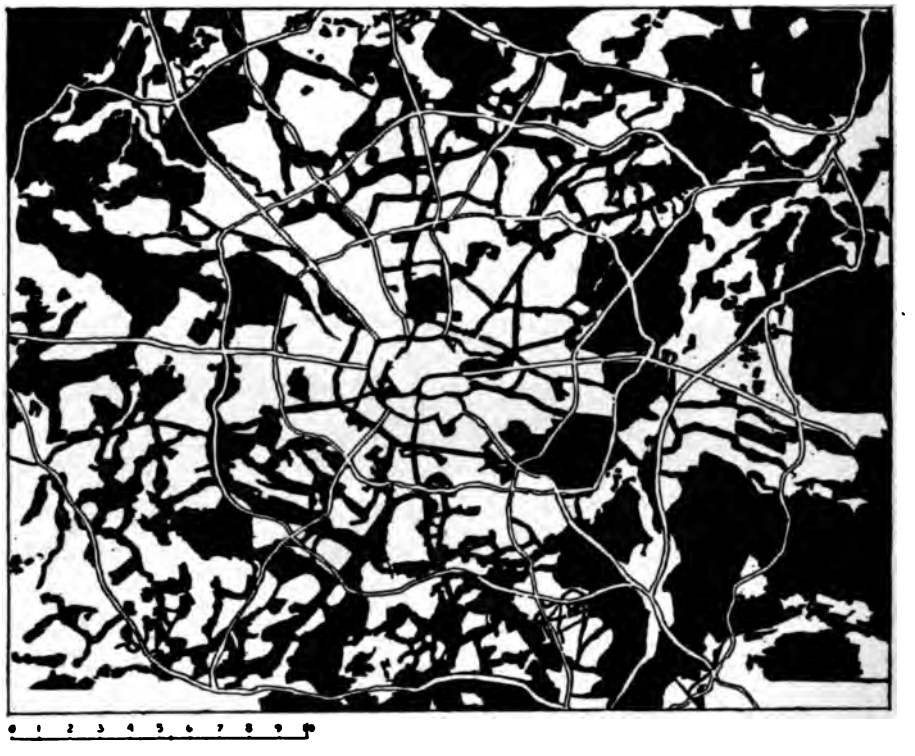


FIG. 44. PARKS AND BOULEVARDS OF GREATER BERLIN

(Population 4,000,000) Scale in miles

than at present, thus adding materially to the welfare of the public.

The city should erect the necessary buildings, plan the parks and grounds accordingly and lease the privileges to competent restaurateurs. Such buildings are also of use in the winter as well as in the summer, when skating and sleighing may be enjoyed, and restaurants and concerts patronized as well.

Among the edifices which may properly be placed in the parks are municipal banquet halls. In such halls, the various municipal and semi-municipal functions could be held, instead of in the hotels as at present. Distinguished guests could be received in more dignity at such banquet halls than in private hostelries.

Permanent grandstands of a limited size should be erected in the larger cities, where parades are frequently held, and now reviewed from temporary stands. Such permanent stands could be constructed in terrace form, treated in a suitable architectural manner and located at a focal point, being thus suitable for reviewing and also an embellishment to the locality.

Among other desirable features in the park system and administered by the department of parks, are gymnasiums, athletic fields, comfort stations, shelter houses, recreation piers, driveways and floral decorations.

Floral parks are a feature of the park systems abroad practically unknown in the United States. Large areas are devoted to roses and other flowers, not merely in the form of small beds as is so often seen here, but in great profusion. In some cities, even, as at Coburg, Germany, large areas of roses are cultivated, serving not only for decorative purposes, but being utilized in the manufacture of perfumery. At Lyon are famous rose gardens which owe their excellence largely to a light soil, an abundance of sunshine, and the proper amount of moisture. From time immemorial rosarians have taken advantage of the favoring conditions until skill and interest in the industry have made the roses of the Rhone Valley known throughout the parks and gardens of the world. Flower beds on an exceptionally large scale are seen in all the parks and particularly in the floral parks in all kinds of designs and colors schemes. The botanical gardens are often a part of such systems. Concerts are also given in the floral parks and ample accommodations for refreshments are provided.

As Americans are, probably more than any other people, devoted to sports, spending a great amount of time, energy and money upon its various branches, and not only par-

PROPOSED ASSEMBLY CENTER ON THE SCHUYLKILL, PHILADELPHIA

Auditorium (22,000 seating capacity) and exhibition palace; Coliseum (40,000 s. c.); Stadium with grand stand (60,000 s. c.); Water Gate for aquatic sports and stations of the Pennsylvania and the Reading railways

THE WILHELMINA SEA-BRIDGE, SCHEVENINGEN, HOLLAND

A well designed surf avenue, bathing beach and recreation pier

ticipating in but collecting in great numbers to witness the contests, the proper treatment of this form of recreation is among the most important to be considered in planning public parks and grounds.

Each city should have, as part of its park system, a spacious athletic ground, which should be located in the suburbs and be of easy access by rail, trolley and highways. Wherever possible, such ground should be located on the water as such locations are usually superior to others, being more agreeable and affording opportunities for design not otherwise found, and in addition, providing for aquatic sports and giving opportunity for bathing and excursions by boat.

For large cities, such a ground should contain a stadium, with a seating capacity of from 25,000 to 75,000, an auditorium with a seating capacity of from 10,000 to 30,000, which may also be planned to accommodate expositions lasting a month or more, and a raised or sunken colosseum seating from 15,000 to 40,000.

The stadium should be in the nature of an athletic field, and be used for football, baseball, aviation meets, county and state fairs, horse shows and the like.

The auditorium should be of a monumental character, and if possible located on a bluff or cliff, with a terrace down to the water gate, also of monumental design. The aquatic contests could thus be viewed from the terrace.

The colosseum should be designed as a place for athletic events, educational, religious and general open air assemblages and pageants. A portion of such a colosseum, at one end of the oval, may be utilized for open air theatrical performances.

The colosseum is preferably sunken rather than raised, as in the latter form it would obstruct the general view and have other disadvantages. The sunken colosseum should be bordered with trees and ornamented with electroliers. The Colosseum of Rome which seated 87,000 was 512 by 617 feet, while the central part used for games was 148 by 282.

If properly constructed, the sunken stadium could be partially filled with water, either for swimming events in the summer or skating in the winter, if other water were not available for this purpose. If on a navigated stream or lake front, a breakwater might be erected to afford a skating place in the winter, free from the usual rough shore ice.

An athletic center of such an elaborate character would of course be beyond the means of all except the largest cities, but it would prove highly profitable to such cities not only on account of the physical and mental improvement of the participants, but also on account of the great number of visitors attracted.

Owing to the great volume of traffic to be handled in the rush to leave the grounds after games were over, all possible transit facilities should be utilized and the most complete accommodations afforded, as otherwise the crowding will have the effect of reducing the number of visitors. Points of departure should be placed on all sides of the grounds leading to centers of transportation distribution in the city.

There are many other features of the park system of a city which might with profit be discussed, but the subject, with others that have been treated, is one that would require volumes for its complete study, and, therefore, only the leading features and those of the greatest degree of novelty are gone into. It will be seen, however, from the principles given, that park systems are of the greatest civic importance and that the subject is one that has received by no means, in American cities, the attention that it deserves and must have.

CHAPTER XII

CIVIC EMBELLISHMENT

Boulevards; Plazas; Parks; Terraces; Monuments; Fountains; Gates; Arches; Shade Trees; Bridges; Comfort Stations; Bay Fronts; Water Gates; Quays

HOWEVER well a city may be planned, its avenues laid out and its parks provided in liberality, it will fail of realizing its full advantages, unless its streets are properly embellished, kept clear of nuisances and given proper attention in every detail.

Such embellishment consists, among other features, of boulevards, esplanades, bridge and park approaches, water gates, quays, plazas, squares, bay fronts, terraces, monuments, statuary, fountains, trees, grass plots, artistically designed electroliers, trolley poles and other structures and details.

The combination of such features makes up the impression given by the streets, and just at this point, carelessness, neglect or inadequacy in the treatment of small structures or other objects, is likely to destroy the whole effect and spoil what has been accomplished at the cost of much time, skill, labor and expense.

A rigid policy of exclusion of all unnecessary objects and the ornamentation or concealment of those that must remain should be followed. The most careful attention must be given to each and every minor detail, and once the method of treatment is determined upon, it must be carried out. If, for instance, house numbers are to be of a certain style, the style must be made known and the requirements enforced, and not be permitted to be avoided or neglected by householders. No details should be overlooked, and under no considerations should new obstructions be given

a place on the street unless demanded by the utmost necessity.

Perhaps the most important features of civic embellishment are the boulevards, esplanades, plazas and the use of grass plots, shrubbery and trees on the streets.

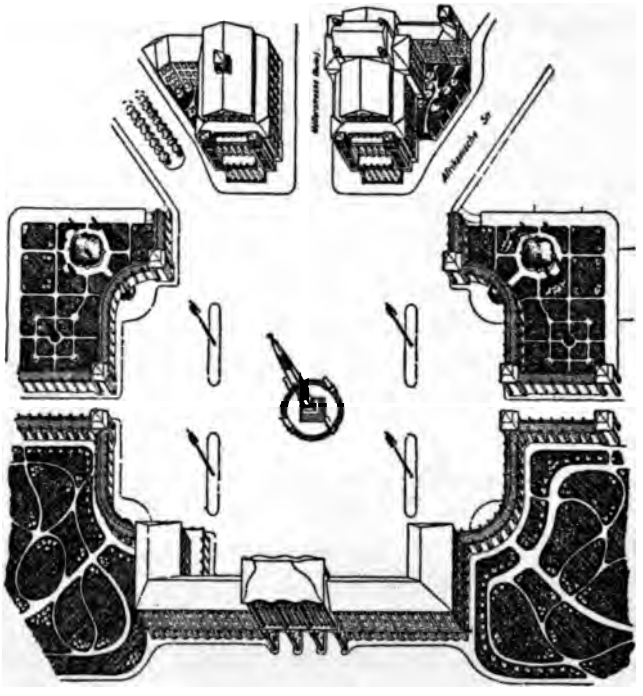
Trees and other vegetation are highly desirable features of civic embellishment, and should be employed wherever it is possible to utilize them. They temper the heat and the glare, afford agreeable shade, relieve the eye, improve the air, reduce the violence of the wind and limit the force of the rain, conceal defects and necessary structures, lessen the dust, improve the vistas and offer unending sources of variety and interest.

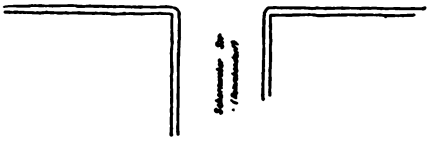
It is always advisable to have the trees under the control of the municipality, and to have them planned to reinforce the character of the street. Thus, if at the end of a street, a monument or other object is to be viewed, the trees should be of such a type that their branches do not interfere with the view.

In the denser business districts, or where a rather complete view, as of some distant mountain or object is desired, the trees should be of a kind that will not grow large. In other avenues, the trees may be larger, leaving, however, an open space to the sky, as though through a wall of vegetation. In other streets, it will be desirable to have the branches of the trees meet in the middle of the street, thus forming an arch, which may be very high for some purposes, giving an effect of spaciousness to the streets, as with great elms or cottonwoods, or such arches may be low, as with maples.

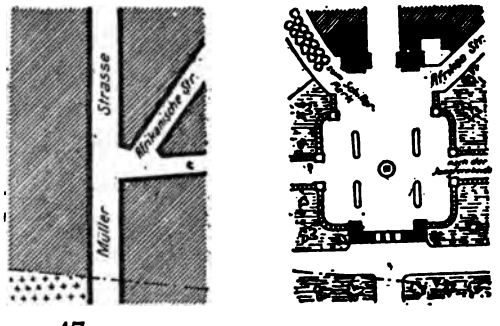
Most large trees span from twenty to fifty feet on either side of the trunk when their development is unobstructed so that the future appearance of the avenue must be kept in view when such trees are planted. The trees being under the control of the municipality, unsuitable kinds will not be used as would be the case had private owners the option of planting whatever suited them best.

In streets in quiet residential sections, in which architectural features are subordinate, trees may be allowed to





PRESENT PLAN



PROPOSED PLAN

FIGS. 45, 46 AND 47. REMODELLING OF GATEWAY AT MÜLLER AND AMERIKANISCHE STREETS, BERLIN, AND BIRD'S-EYE VIEW OF PROPOSED IMPROVEMENT

grow in their own way, as an effect of individuality is thus obtained, which is lost when the trees are pruned too continuously.

In cities in which it is feasible to plant trees between the car tracks, it should always be done, as they prove in such location of exceptional value. With grass and shrubbery, that side of the track is made more interesting to the passengers, and the tracks are made less unsightly to the general public. The undergrowth absorbs a great deal of the noise as well. When trolley wires are used, the trees conceal the poles, while shrubbery of large size serves to conceal structures of a purely utilitarian purpose.

Depending upon the locality and the desired effect, trees in the business districts are pruned to a greater or lesser extent, often being kept down to ten or fifteen feet in diameter, as is also done on some streets and boulevards and in formal parks, while on broad streets and squares they may often be allowed to grow to any size.

In selecting trees for use in streets and in other parts of the city, attention must be paid to the effect to be secured, as some kinds of trees are effective in certain environments but not in others. The Lombardy poplar, for example, is quite out of place on some streets, but highly effective when placed in rows around quays, or on piers, or used as a means of setting off promenades or isolated features, being often employed with remarkable results in island parks and on free approaches.

Another very effective use of trees is that in which a single great tree stands alone or near a church or other structure, and either by itself or with its accompanying structure, is the terminal of a vista. Sometimes two trees may be so employed, but with three or more, the striking effect is lost. Examples of a single tree so used are seen at Oldenburg in the Gertrude Church Yard, where the tree overtops the steeple of the church and at Freiburg at Salz and Herren Streets, where the tree shelters a fountain at the point of branching streets, the tree thus being the focal point of the center.

THE PIAZZETTA, VENICE, DOGE PALACE IN REAR

Small flagstone paving

HARBOR GATE, LINDAU

Tower and monument form an interesting disymmetric contrast

MONUMENTAL ELECTRIC LIGHT COLUMNS, BERLIN

An embellishment of the Charlottenburg Bridge, Berlin, breaking up monotony of long straight streets

RIVER PROMENADE, THE RHINE AT DÜSSELDORF

Freight handling apparatus on lower level. Highly ornamental electroliers

Trees in cities must receive the best of care, as they are growing under anomolous conditions and are likely to succumb unless constantly looked after.

In selecting trees for city use, in addition to selecting those which are suited to the æsthetic purposes to be attained, the nature and condition of the soil must also be considered and suitable arrangements made for an adequate water supply. This may often be effected by blind drains, laid at the time the tree is planted and regularly filled with water. The system of gutter seepage previously mentioned is also useful.

Among the trees which are useful for city purposes are the following: Norway Maple, Sugar Maple, English, Scotch and American Elms, Cottonwood, Horse Chestnut, Red, White and Pine Oaks, Ash, Catalpa, Linden, Kentucky Coffee Tree, Thornless Honey Locust, Lombardy Poplar, Evergreen Pines and Cedar.

Among the various structures and minor utilities which are a necessary part of the equipment of streets and which must be provided for and treated in the proper spirit are tramway stations, elevated railroad structures, subway entrances, safety isles, meteorological stations, news stands, comfort stations, advertising kiosks, electroliers, trolley poles, letter boxes, fire and police alarm boxes, hydrants, street signs and various forms of advertising signs.

The proper method of treating most of these items has already been sufficiently indicated, but a further consideration of some of the items may be useful, for it is always possible to treat all such equipment in such a way as to make it serve an æsthetic as well as a utilitarian purpose.

Trolley poles in cities using the overhead system, if properly designed, can be made a highly ornamental feature of street equipment, despite their condemnation by many landscape architects. Indeed, certain civic engineers, after struggling with the problem of the street car on boulevards and being unable to solve it, suddenly turned about and announced the impressive discovery that the

street car was in reality a decorative feature of the first æsthetic importance. The same naïvety may be expected when the effect of suitably designed trolley poles is discovered.

A question of the greatest importance in city planning, yet one which does not receive the attention that it should have, is the public comfort station. The health of the public is seriously affected by the neglect on the part of cities to erect an adequate number of such structures. Physicians cite numerous diseases and ailments which arise directly out of such neglect, although no very loud demand seems to come from county medical associations for their establishment, as they are probably too much engaged chasing quacks.

The situation for women is much more serious than for men, since the presence in every corner saloon of such facilities solves the problem to a large extent for men, while women must go to department stores, hotels, office buildings and frequently the family entrances of saloons or "hotels," coming thus in contact with an element from which no improving results can be expected. In the business districts, women, though embarrassed in so doing, must inquire of banks, real estate and brokers' offices and similar business houses. In a Western city, it was proposed in a labor union meeting to request department stores to close on Labor Day, but this was objected to by a member on the grounds that such a closing would deprive his wife and daughters of the facilities found in such stores. The result of his well-taken objection was that the stores were permitted to remain open.

In some office buildings the elevator starters estimate that one-third of the passengers of the elevators enter the building solely for the purpose of using the toilet facilities, and for that reason, many of the more exclusive of such buildings lock their toilets, providing the tenants with individual keys.

As there is, in most of the facilities in which American cities are deficient, "a negro in the woodpile," so there is in the matter of public comfort facilities. Political influence is against them for the reason that saloons find their com-

fort facilities more useful in attracting the public than even the feature of free lunch. With adequate public facilities, the revenues of the saloons would be materially reduced.

On the New York, New Haven & Hartford Railroad, the use of the facilities of the stations has recently been closed to all except the travelling public. This would appear to be in the nature of an imposition, since a railroad, being a a public service corporation, should, like the licensed inn keeper or saloon keeper, be required by law to maintain such facilities, even though most corporations do so voluntarily.

Two methods are followed in the architectural treatment of comfort stations, one to place them underground with entrances as inconspicuous as possible, and the other to make of them small monumental structures. Owing to the fact that many of such structures have been very ugly, and to the prejudice against them, the underground comfort station, with no surface indication of its presence, is growing in favor.

Among the most successful comfort stations, from an architectural point of view, are some of those in New York, particularly the one adjoining the Public Library on West 42d Street, at the corner of Bryant Square; the one at the north end of Battery Park and another on Riverside Drive.

In foreign cities, structures of this kind are architecturally much superior to and much more varied than those in America, often being in a rustic style, neat in appearance and not calculated to indicate their use. They are placed on squares, bridge approaches, quays, in blocks and parks, and usually surrounded by shrubbery.

It is of the greatest importance to have such stations sufficiently numerous, for example, not more than ten blocks apart. European cities provide such stations in adequate numbers, and owing to their presence, their use has become much more a matter of custom than it is in American cities. English cities are well provided. Liverpool maintains about forty and Glasgow an equal number. Berlin maintains 450 stations or about one to every 10,000

of population, which for a large city, is a sufficient number. Most of the English stations are underground, and the same system is very largely followed in the United States, especially in the business districts, where, however, the mistake is too often made of having the entrances for men and women in close proximity.

In cities in which there are elevated and subway roads, the necessity for public stations is not so great, since the stations of such roads are provided with conveniences. They are, however, reserved for passengers, which greatly lessens their usefulness, and it would appear to be the part of wisdom for legislatures to provide that such facilities should be open to the public.

Cities might also with great advantage make arrangements with certain classes of stores, such as drug stores, tobacco stores and others open at all hours, for placing public comfort stations in their basements. The traffic through the stores would add to their revenues, while the proper arrangement of the stores could be such that the object of the visitor would not be apparent. An emblem of a suitable character might be affixed to the front of the store, which would indicate the sanitary convenience afforded but which would not prejudice the public against the store or the convenience, as they are prejudiced against the municipal stations.

To make the municipal stations less objectionable, it would be a good plan, especially in the stations for women, to provide additional facilities, making such stations a public convenience in every sense of the word. In addition to the usual service, telephones, city directories, checking of bundles and dressing-room service should be provided. Women attendants should have for sale combs, sanitary napkins and other articles, and pins, needles, thread and the use of clothes brushes should be free. Such stations should be provided with a rest-room containing a sanitary reed couch and a lavatory, with soap and towels for sale.

Through co-operation with office buildings and stores, cities could install adequate conveniences at a much lower

cost than by the erection of independent structures which are seldom utilized except by the lower classes. In the outlying districts and in parks, the erection of suitable buildings is more necessary. Where such a structure is

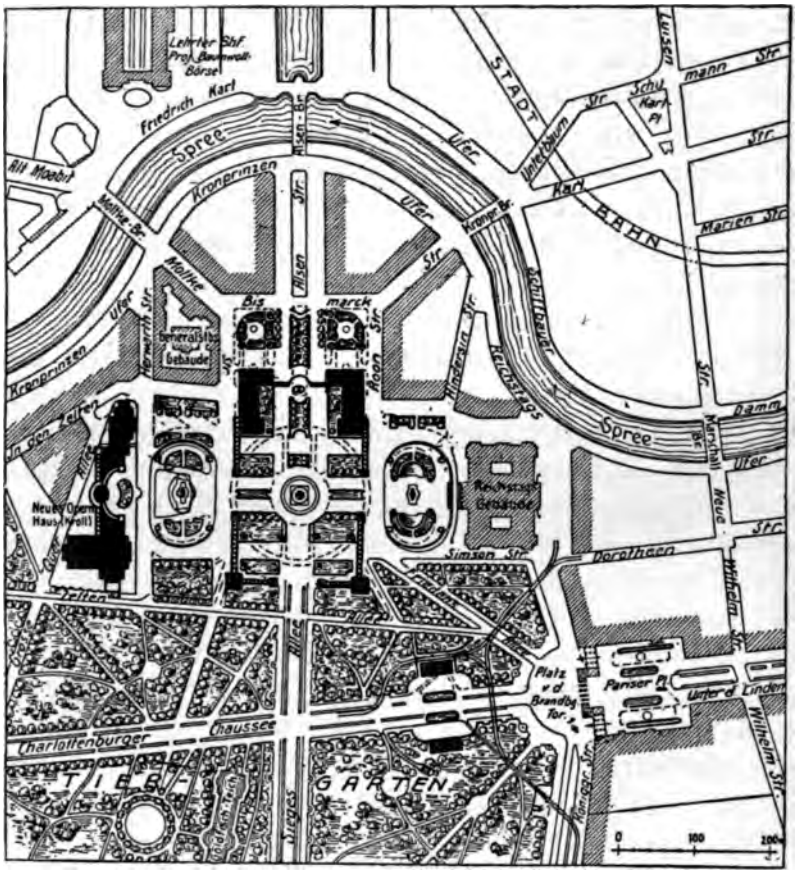


FIG. 48. GROUND PLAN OF PROPOSED KING'S PLAZA, BERLIN
A Portion of a very Comprehensive Replanning Development now under Way

erected in a park or where underground stations are provided, there should be an emblem to indicate the location. For this purpose, the usual sanitary emblem of a red cross on a white ground could be used, with an arrow on one of the arms of the cross indicating the direction of the station. In order to be less conspicuous, the color of the cross could be of a duller shade of red than that usually employed, and

the ground be gray or dark instead of white. Such an emblem, only two or three inches in diameter, tacked to trees or posts, would serve its purpose without being unduly conspicuous. It could also be set in tile in the sidewalk. In crowded sections of the city, such an emblem in the sidewalk, say four or five inches in diameter, with the arrow in one arm and a figure in another indicating the number of blocks to the nearest station, would prove very useful. The same emblem, say but an inch in diameter, would serve for the druggist's window where convenience facilities were provided. It could certainly not mean any less to the health of the public than the present emblem, affecting, as it would, such a vastly greater number of persons.

The interior arrangement of comfort stations is a matter depending upon the location, but is a detail which requires experience for proper determination. In fact the whole construction of the station is often no small problem, and new features are constantly being added which need to be taken into consideration. Enough has been said, however, to indicate the great field for improvement which American cities have before them, and which they cannot undertake too soon to cover.

Perhaps the most noticeable of the small structures of European streets is the advertising column or kiosk, which has been referred to. While such columns may be objected to by those who are not familiar with their use, yet since no large posters are allowed and since public advertising is more or less of a necessity, the columns are found to be of real service to the public, especially in regard to announcements of theatres and public meetings by which they are mostly occupied. Since no sandwich men, banner men, billboard wagons or similar advertising schemes are permitted, the advertising column may well be pardoned. For ordinary commercial purposes, newspapers are found to be the best sources of publicity and the public is thus saved the frightful displays of crude posters and signs which deface American streets. A commercial advertisement is

ROTHENBURG ON THE TAUBER

Herrengasse; in distance the Burg Gate; at the left Fountain and at the right the City Hall

KAISER FREDERICK MONUMENT
CHARLOTTENBURG

UNTER DEN LINDEN, AS SEEN FROM THE SCHLOSS BRIDGE
Effective illumination by means of open arc lights

thus seldom seen displayed in public. At prominent corners, however, often four advertising columns may be placed, two for the usual purposes and two for news stands. They are not, however, without a certain artistic effect, and do not excite adverse criticism.

In Germany and Austria advertising art has advanced very rapidly during the last decade. The best posters made come from the hands of German and Austrian designers. These men are especially trained for this form of art and display extraordinary ability to use large masses of glowing colors in striking yet harmonious designs. Americans are thought to be a people fond of jokes, but in what may be termed "humorous drawing" the Germans outdo us at every turn, and an official billboard in a German street will often be covered with quaint designs, each signed by the name of some famous poster maker.

Boulevards, with their rows of trees and well laid out grass plots, are among the most interesting features of a city. They form, in fact, continuous parks, and are a source of constant enjoyment and elevation to the resident and the visitor alike, since no one can promenade an avenue beautifully laid out without feeling its influence.

But when the city itself has fulfilled its whole duty in the embellishment of its streets, avenues, promenades, boulevards and parks, it is still necessary for the individual citizen to complete the work by the erection of suitable and artistic buildings and residences. The work of the city is, at best, only a small share of what goes to make up the effect of the street, which depends finally upon the structures which fill it. What the private owner builds, therefore, is what makes the city, and he should therefore realize his responsibilities and put up only structures of a design calculated to improve the city. Municipal regulations should also enforce a certain architectural standard, for the benefit of the whole city, whether agreeable to the private owner or not.

For the encouragement of private owners, foreign cities often offer rewards for the erection of the most artistic facades. When a new street is opened, the prizes are an-

nounced, and when the street is built up, the awards are made. The prizes are usually so large, in Brussels, for example, often being $4000, $2500 and $1500 for the first, second and third best façades, and in Paris one-half of the street tax and medals, that they arouse lively competition among house owners and architects. Such a system may also be applied to streets already constructed, in which case the prizes may be awarded to the best façade erected during a certain term of years. A system of this kind puts a premium on good designing and amply repays the outlay.

In American cities where no such incentives exist, and where the sense of the æsthetic is not so highly developed, the owner may erect almost any sort of a house, while the contractor building rows of houses is an even worse offender.

This unbridled liberty or license, more properly speaking, has produced incongruous and heterogeneous cities, principally distinguished as collections of buildings which are masterpieces of ugliness.

Although the system, or lack of system, has produced the great skyscrapers of New York and other large cities, evolving, in an artistic sense, an architecture distinctively American, it has had the effect of making American streets mere strings of unrelated structures, in which all sense of beauty and proportion is lost.

It is a matter of wonder, passing through an American city, where the hordes of utterly unfit architects have come from that have filled the land with such frightful examples of their art. How the American can feel any interest in the purely utilitarian business buildings in which he transacts his affairs, or any attachment to the conglomeration of rooms he calls his home, is difficult to see. Indeed, it is surprising how he can find the place he calls home, for on many streets whole blocks of houses will either be duplicates of each other, or in two series of duplicates, each alternate house being similar, like an endless sandwich, with layers of bread and corned beef indefinitely.

America is only waking up, only commencing to exist architecturally. Some of the skyscrapers and some of the

TWO BISMARK MONUMENTS: HAMBURG AND BERLIN

The former a rugged and powerful example of a huge monument placed in a commanding position and the latter in a more formal style

VOLKERSCHLACHT MONUMENT AT LEIPZIG

(Largest monument in the world)

Erected to the memory of fallen heroes who died for the liberation of the Fatherland, 1813.

HERMANUSSCHLACHT MONUMENT IN THE TEUTOBURGIAN FOREST

In the year A.D. 9 Arminius the Cheruscan gained a signal victory over the Roman general Varus on this field

Striking Examples of memorials commemorating patriotism

public and private buildings are good, but the taste of the public is not yet formed. An ugly house is simply a house. It gives no pain on account of being ugly, for the eye of the public is uneducated and as little troubled by bad architecture as the eye of the illiterate by bad spelling.

Mr. Ernest Flagg, designer of the Singer Building, and of many other notable structures, in an article, "Are American Cities Going Mad Architecturally?" in the *New York Times* of August 6, 1911, describes conditions truthfully when he says:

"Our artistic sense is undeveloped. There is no great body of amateurs here, such as is found in more refined communities, who are capable of analyzing our productions and placing them at their true worth. It is only a question of time, however, when public taste will become more cultivated, and when that time does come, there will be a great tumbling of reputations which now stand high.

"Our architecture smacks too much of archæology; it is not modern; we use modern methods of construction and antique methods of design. Why do not the people of the United States recognize that every great work of art which has had an undying reputation, was strictly modern when it was made? No copy, or adaptation, no matter how cleverly done, can endure the test of time and stand as a work of art.

"We are veritable barbarians in matters of taste, we ransack Europe for old fragments which, though they may be charming in their original situation, become little better than so much rubbish when set up in the midst of inharmonious surroundings. We deck out our houses and gardens with these things, in precisely the same way and with as little regard to propriety as savages when they array themselves with the incongruous objects which they obtain from European traders.

"The savages which Henry Hudson, on his second visit, found wearing the hatchet heads he had sold them, as neck ornaments, present no more comical picture than our art

amateur often does in his use of spoils from European churches and monasteries.

"One sees gardens attached to shingled cottages, decked out with marble seats, vases and fountains taken from Italian villas. Houses in our cities are fitted out with fragments from European palaces which are as much out of harmony with the surroundings as a steam engine would be in a mediæval church. Sometimes whole interiors have been taken from a European building and set up here. Rich men's houses are turned into museums, where there are as many styles as there are rooms, all warring with each other and with the exterior of the building.

"We have been having a very carnival of vulgarity, and an ostentatious display of wealth and bad taste by people who are regarded as leaders in refinement.

"In the midst of the chaos and confusion, with public taste at as low an ebb as it probably ever reached among people who pretend to be civilized, with architecture for the most part in the hands of men who have had little training in, or knowledge of, even the elementary principles of design, our new methods of building were ushered in and we were called upon to deal with a problem the proper solution of which called for a more technical and artistic skill than we possessed.

"The time is at hand when the absurdity and bad taste of our past methods will be fully understood and freely admitted. We shall cease to wonder that cultivated foreigners are not favorably impressed by our tall buildings, and will set ourselves to work to make them as perfect and reasonably artistic as they are ingenious and daring mechanically and constructively."

The lack of artistic feeling for architecture has its counterpart in not only other structures, such as bridges, docks and terminals, in which it should naturally manifest itself, but also in various kinds of design, where the utilitarian purpose crowds out every other consideration.

Engineers particularly design their works with little

attention to the beautiful, and in the most important feature of modern times, the rapidity with which the numerous discoveries in science are applied to commercial purposes, there is lacking, throughout, the touch of artistry.

In order to have such engineering undertakings appeal to the public or the layman, it is essential to give them consideration from the artistic standpoint, and this is doubly important when such structures are to be located in or near a considerable community, and particularly when such a community is one educated up to the desirability of the application of æsthetic principles to the arrangement of its structures.

A principle of city planning in the application of which great results may be obtained, is that of color.

American cities, particularly, tend to assume a certain dull, greyish weather-beaten appearance, due to dust, smoke and climatic effects, and the presence in the air of acids from factory smoke. In modern cities, such conditions soon obliterate the appearance of freshness and newness, and age seems to overtake very quickly all kinds of buildings.

The relief of color thus becomes doubly appreciated, but in its application the same æsthetic principles must be observed that hold good in other departments of city planning. There must be harmony of color between adjoining buildings and a proper sense of color effects, in order that certain buildings will not detract attention from those which should attract the eye. The purpose of color should be to reduce monotony and to accentuate the existing æsthetic balance and variety. Where buildings are not well related, color effects may be employed to emphasize certain ones, and to minimize the discordant features of the whole effect.

It is, however, largely the custom in America to leave buildings in the natural color of their material, particularly stone and brick buildings, though brick buildings, especially when they begin to show signs of wear, are painted. Stone is seldom painted, and stone buildings have thus been exposed to the mercy of the elements. Disintegration has proceeded at a rapid rate, and the effects of a few decades

have been, in many cases, almost disastrous. In the old brownstone houses of New York, window sills, balconies and steps have crumbled almost off, and great scales have dropped from the walls.

In Central Park, New York, the Obelisk suffered more disintegration in a few years than it had in as many centuries in Egypt. The timely discovery, however, that a coating of hot paraffine, sinking slightly into the surface of the stone, will preserve it indefinitely, is proving of the greatest value to owners of stone buildings and insures a larger use of stone in its natural state in future.

Americans prefer buildings in the natural color of their materials, our cities are practically devoid of any definite color scheme. With the use of glazed brick and tile, however, new color effects are being obtained, as such materials are but little affected by the atmospheric conditions. The rain washes off most of the dust and soot. The use of such materials, however, is not likely, for a long time, to make any considerable change in the aspect of our cities, which are likely to continue more or less monotonously weather-beaten in appearance.

In marked contrast to American cities are those of Russia, in which the building conditions are such as to encourage the demand of the Russian for bright colors. Most of the buildings in the cities are of brick, which if exposed to the weather would soon crumble. They are accordingly covered with plaster, which has to be renewed frequently, and painted. The opportunity for materials in their natural color thus being limited, the use of surface coloring is utilized to produce a great variety of effects. Not usually being subject to regulation, the results are often bad, but when, by accident or design, the color scheme is harmonious, splendid effects are produced.

As an illustration of the variety of colors employed, during a recent season in St. Petersburg, the Winter Palace was painted a light chocolate coat throughout, the usual method; the Ermitage — the art museum — light buff; the Imperial Archives, white; the Ministries, dark brown; the Admiralty,

light yellow, and another building in black. In Moscow the Church of St. Alexis had red walls, white trimmings and a green roof, the Church of Ste. Catherine, blue and gilt, and the Petit Palais, yellow and white.

Color scheme of surface painting could be applied with great effect in numerous parts of the United States in which frame buildings abound, but which are ordinarily painted white with green trimmings. In cities, in which concrete structures are increasing in numbers, surface painting may be employed with effect, since recent discoveries in chemical science enable concrete buildings to be painted.

Concrete may also be colored when it is mixed, and the color thus made integral. While an expensive method for large reinforced concrete structures, it could be used with great advantage in houses built of concrete blocks, in which the outer shell might be in different colors, suitably harmonized, or only certain parts in color in contrast to the remainder in natural concrete.

An interesting example of colors in natural materials is seen in the Broadway-Chambers Building, New York, in which brick and tile furnish reddish and terra cotta effects in a most pleasing and harmonious manner, and the College of the City of New York, in which white and slate blue are employed with striking results.

Civic embellishment, as will be seen, is a subject of the most extended nature. It is of vital importance to a city, and in addition one which will, in some, at least, of its numerous phases, afford every citizen an opportunity of adding his individual contribution to the city's appearance.

And when each citizen is doing his share individually, he will be much more interested in the work of the whole city, while the taste cultivated in such embellishment will lead to a better realization of the advisability of city planning itself.

CHAPTER XIII

BUILDING REGULATION AND BLOCK PLANS

Height of Buildings; Arrangement of Buildings; Proportion of Lot Built Upon; Gradation of Factories; Size of Apartments; Workingmen's Houses; Block Plans

In the art and science of city planning, the element of elevation is of fundamental importance, and the æsthetic principles of elevation are similar to those of the other elements of design; that is to say, in the elevation of buildings, the laws of harmony, variety, contrast, symmetry, balance and the like must be observed.

In earlier city planning when churches were the highest structures, the church was taken as the principal feature of the skyline, and the other portions of the city and other buildings scaled thereto, the spire dominating the city and showing to the traveller at a distance the presence of the city. Where several churches existed in a town, the spire or spires of one were made sufficiently important to dominate the others. The same principles still hold good and are being followed in continental city planning. The accompanying illustrations of the cities of Cologne, Bremen and Hamburg, opposite page 168, give the principles, which, however, are not applicable in the United States, owing to the evolution of the skyscraper.

In planning a street or avenue, its length and width should be determined, and having been limited on the principles already pointed out, the height of the buildings and the skyline should be considered. The street or avenue should be treated as a unit, and some building on it should dominate the others. There should be a certain variety in the height of some of the buildings in order to enable the principal building to be balanced, and to afford the necessary

contrast throughout the avenue. The principal building should ordinarily be at one of the closures of the street, although in some cases it may be placed at another point.

In many cities, hard and fast rules have been laid down as to the heights of buildings, and while in a general way such rules are good and accomplish many useful purposes, if they are not applied with judgment and adapted to the

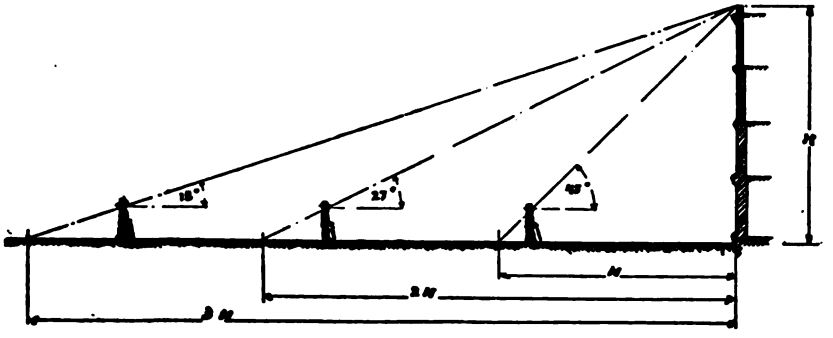


FIG. 49. THE RELATION OF THE HEIGHT OF BUILDINGS TO WIDTH OF STREET IS DETERMINED BY PICTURE TO BE PRODUCED

When the street is only as wide as the height of the buildings the spectator must look upward at an angle of 45 degrees to see the cornice line, and in addition only a limited length of cornice can be seen. Only when the street width is three times the building height can a pleasing and satisfactory view be obtained

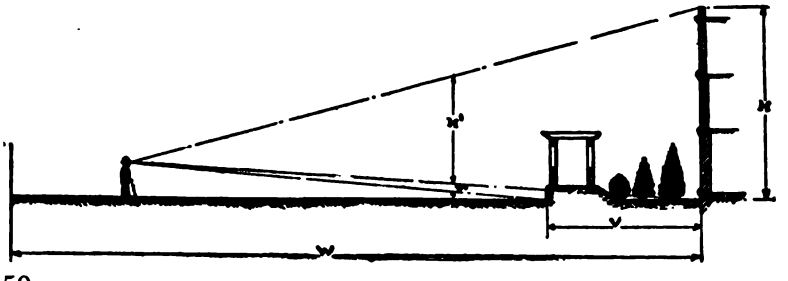


FIG. 50. IN ORDER TO BALANCE A LOW BUILDING BACK OF THE BUILDING LINE, WITH TALLER ONES ON THE BUILDING LINE FLANKING IT, PARKING AND A LOWER ORNAMENTAL OR MONUMENTAL STRUCTURE IS PLACED BEFORE IT

circumstances, they may produce ill effects. In Paris, for example, the regulations as to the heights of buildings have had the effect in many streets of producing monotony, and the skyline is usually monotonous. Too much blame should not be placed on the regulation, however, as in some Pari-

sian streets, under the same regulation, monotony has been avoided. In New York, too, where there is no regulation, endless rows of brownstones of the same height and identically the same skyline have been erected, veritable triumphs in monotony. It is, nevertheless, impossible to produce the best effects of variety when a procrustean regulation as to height is in effect.

Instead of an inflexible ordinance in regard to the heights of buildings, a city should have a board of civic engineers with authority to pass upon the design of every building, and no building should be erected without its plans having first had the approval of the board. With ample authority, the board could accordingly refuse to issue building permits for structures not in conformity with the remainder of the street and only such buildings permitted to be higher than the others as would improve the appearance of the street.

That it is absolutely necessary to have a certain variety in the heights of buildings and their façades, is evident when the effect is seen of uniformity, such as in the Royal Crescent at Bath, England, and Regent's Quadrant, London. In these examples, though the style is substantial, the façades are all similar, the cornices alike and the skyline unvaried. An effect of monotony is thus produced. Even if it had been the intention of the designers of these buildings to have them regarded as an architectural entity, and not as separate structures, a most unsuccessful result was produced, particularly as in each case the buildings, being on semi-circular streets, afforded unusual opportunities for æsthetic treatment. A street which is the segment of a circle or which has some other form of curved plan, can be made much more pleasing than a straight street, as the façades appear to better advantage and the whole street is more of a unit and more picturesque. For the pedestrian, the constantly changing view absorbs the attention and enables the distance to be covered with less sense of fatigue.

Where there is no regulation of the heights of buildings, as in New York, not only the utmost architectural disorder ensues, and a jungle of buildings springs up, but most unjust

COLOGNE, BREMEN AND HAMBURG

Skylines of cities where the towers of churches dominate the rest of the city

MUNICH, MAXIMILIAN STREET AS SEEN FROM THE MAXIMILIANEUM

Excellent example of river bank treatment

commercial conditions arise. Buildings adjoining a skyscraper lose a large part of their rental value, while the skyscraper itself never proves very remunerative, the returns on the money invested varying from 2 per cent to 7 per cent, and averaging not more than 4 per cent and seldom reaching 5 per cent. In many cases, the skyscraper, especially when in the form of a tower structure, is put up largely for advertising purposes, so that the rental revenue derived is not the only return. The skyscrapers set a higher standard of office accommodation, and thousands of firms must measure up to it that cannot afford to do so. As they make no large profits for themselves and depreciate the value of other property, it will be seen that they are by no means a commercial blessing.

A more equitable plan than either absence of regulation or too rigid regulations, would be, in addition to the flexible regulations of the board of civic engineers suggested, the imposition of a progressive tax on the height of buildings, increasing the rate for every floor to such an extent that tall buildings would bear a large additional burden of taxation.

As public buildings are comparatively few in number, the only way, as has been indicated, by which the appearance of the streets can be given desired characteristics, is through the regulation of private building enterprise. Opposition to such regulation can have no foundation other than that of private interest, and no outcome except confusion and injustice.

That such regulation is feasible is indicated by the regulations imposed on theatres and the fireproofing regulation of buildings of certain classes. No good argument can, in fact, be advanced against regulation.

A form of encouragement to private owners to erect new buildings which proves effective abroad, is that of tax exemption for a term of years on a new building. This could be carried into effect in the United States by suitable boards of officials who would, for example, select certain unimproved sections or those covered by small or old buildings, and declare that if new buildings were erected, the

owners would be exempt from taxation for five years from the time of the declaration. The owners would thus have an incentive to erect the new buildings as promptly as possible, since delay would give them a shorter term of exemption from taxes.

The same principle is already carried out in another form in many American cities, through giving free sites to factories and similar tax exemption inducements.

Perhaps the regulations most generally in effect abroad are those which limit the heights of buildings. Such limits are customarily placed sufficiently low, so that the value of the land will cause all the buildings to be run up to the full limit of the regulations.

The height of buildings is generally limited in proportion to the width of the street. While the proportion differs somewhat in different cities, the regulations of Paris are representative. They are as follows:

In streets less than 12 meters wide (39 feet) the height of the building must not exceed the width of the street by more than 6 meters (19½ feet). For every additional width of a meter in the street, a quarter of a meter (9⅞ inches) may be added to the height of the building until a limit of 20 meters (nearly 66 feet) to the eaves is reached, which no building may exceed.

Thus a building on a narrow street may be 59 feet high, while on a wide street but 66 feet, a difference of only 7 feet. This in reality is insufficient to afford the necessary variety between streets, since all the streets of a city should not be confined to buildings of practically the same height.

The regulation as to the height being taken to the eaves, has the effect of modifying the architecture of the buildings, producing mansard roofs, which gain an additional story without violating the code.

In German cities the height of buildings is somewhat similar to those in Paris. In Berlin the height varies from 18 to 24 meters or from 59 to 79 feet. The minimum height to which buildings are limited varies in different cities. In Wiesbaden, Bremen and Barmen it is 15 meters (49 feet), in

Hanover 14½ meters (46½ feet), in Düsseldorf and Breslau, 13 meters (42⅝ feet), in Munich 12 meters (39⅛ feet), and in Kiel and Cologne 11 meters (36 feet), this being the minimum on the narrowest streets. It is greater, however, in wider streets.

Not only is the height of buildings regulated in German cities but also the maximum and minimum number of stories, which depends, however, on the zone in which the building lies.

In Berlin and Hamburg, the greater part of the buildings must be either four or five stories in height. Throughout

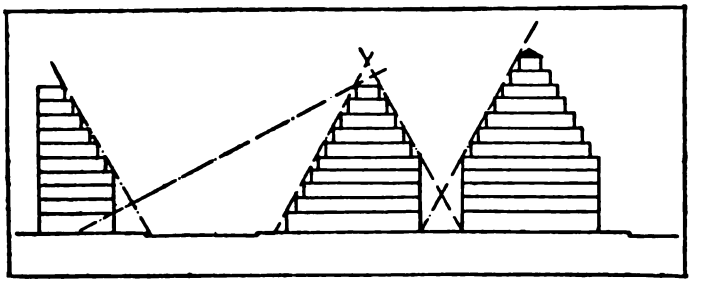


FIG. 51. SUGGESTIONS FOR SETTING BACK FLOORS OF TALL BUILDINGS

the Grand Duchy of Baden, the number of stories runs from three to five in the suburbs and outlying districts, three being the maximum and in the business districts, five. In Munich, Cologne, Düsseldorf, Halle and Breslau, all buildings must be at least two stories in height, but in Bremen, one-story buildings may be erected. In Baden, houses in the country are not permitted to be over two stories in height.

The fixing of the limitations as to the heights of buildings should be undertaken only with the most careful consideration, since real estate values are limited and the city caused to grow in an altogether different manner than if not regulated. Once such regulations are fixed, they should not be changed except for the most important reasons, for buildings once having been erected under the regulations, any change will have the effect of discrimination either against the new ones or the old ones.

American cities have to a certain extent taken up the

question of the regulation of the heights of buildings. The Commission on the City Plan, Hartford, Conn., investigated the subject and in its report for the year ending March 31, 1911, gave the result ascertained. Of the thirty cities listed, nineteen had no ordinance governing the height of buildings. These cities were as follows:

Albany, N. Y., Atlanta, Ga., Cincinnati, Ohio, Dayton, Ohio, Milwaukee, Wis., Minneapolis, Minn., Newark, N. J., Paterson, N. J., Philadelphia, Pa., Reading, Pa., Nashville, Tenn., Richmond, Va., San Antonio, Tex., Spokane, Wash., Salt Lake City, Utah, Syracuse, N. Y., Tacoma, Wash., Toledo, Ohio, and Trenton, N. J.

The ordinance provisions of the eleven other cities, as abstracted or quoted in the report, are as follows:

Baltimore, Md. — No building more than 175 feet, except that towers, spires or belfries in fireproof buildings may extend to greater height.

Boston, Mass. — No ordinance, but building laws provide the following: City divided into districts. District A, buildings of fireproof construction can be erected to a height of 125 feet, in another district to the height of 100 feet, in a third, 80 feet, but the buildings in these later districts are not of the same construction as District A.

Buffalo, N. Y. — "Outside the fire limits of the city of Buffalo, it shall be lawful to erect frame buildings not exceeding 50 feet in height from the sidewalk to the highest point of roof."

Cleveland, Ohio. — "No building or other structure hereafter erected except a church spire, shot tower, water tower or smoke stack, shall be of a height exceeding two and one half times the width of the widest street upon which building faces, but no building shall be over 200 feet high."

Denver, Colo. — "No building or structure to exceed 12 stories except spires, towers, smokestacks, etc. All buildings or structures more than 125 feet high, absolutely fireproof."

Los Angeles, Calif. — Fire district, 1 story only and not over 16 feet high.

Class A. All buildings upheld by masonry or reinforced

concrete or framework of steel or iron. Fireproof or skeleton construction. No building over 150 feet, allowing 30 feet for mansard roof — not more than 7 stories.

Class B. Masonry or masonry and steel, and iron and steel buildings, supporting iron or steel masonry. Not over 100 feet high, nor more than 8 stories.

Class C. Masonry or reinforced concrete walls, floors not wholly carried by steel columns, and girders or reinforced concrete and masonry — 85 feet high, not more than 6 stories exclusive of basements.

Class D. All buildings not included in A, B and C, 50 feet high, not more than 4 stories.

Louisville, Ky. — No non-fireproof building or structure outside the fire limits shall exceed 70 feet in height, but this shall not apply to spires of churches or similar buildings outside of the fire limits which may be constructed of wood to a height of 125 feet above the curb level.

Portland, Ore. — Class I (absolutely fireproof), 12 stories or 160 feet.

Class II (fireproof, short span), 12 stories or 160 feet.

Class III (fireproof, long span), 10 stories or 140 feet.

Class IV (semi-fireproof), 6 stories or 85 feet.

Class V (mill construction), 6 stories or 85 feet.

Class VI (ordinary construction) 4 stories or 60 feet.

Class VII (frame construction), 3 stories or 42 feet.

Providence, R. I. — No ordinance. Building law provides "No non-fireproof building or structure hereafter erected should exceed 65 feet in height."

"No fireproof building (ordinary) or structure hereafter erected shall exceed 120 feet in height, except that structures or appendages may be built upon roofs of said buildings not exceeding twenty feet in height, provided that said structure or appendages shall be built of incombustible material throughout."

"Every building hereafter erected or altered to be used as a theatre or public station which exceeds three stories or more than 40 feet in height, shall be built fireproof (absolute) except as hereinafter specified."

Rochester, N. Y. — No ordinance. Height regulated to conform to size and strength of foundations and construction of walls.

San Francisco, Calif. — Fireproof buildings, 102 feet; semi-fireproof buildings, from 55 to 86 feet.

The maximum heights of buildings permitted by ordinance in some of the other large cities of the United States having such restrictions are:

	Feet
Charleston, S. C.	125
Chicago, Ill.	200
Erie, Pa.	200
Fort Wayne, Ind.	200
Indianapolis, Ind.	200
Manchester, N. H.	125
Milwaukee, Wis.	225
Newark, N. J.	200
Salt Lake City	125
Scranton, Pa.	125
Worcester, Mass.	125

As will be seen from these regulations, a tendency against skyscrapers is beginning to manifest itself. It seems, indeed, that the crest of the wave has been reached. The fallacy of erecting such buildings is beginning to manifest itself very clearly, for they bring in their train many disadvantages and very few compensating advantages. In addition to setting a higher standard of office occupancy, they produce congestion in the streets they occupy, and check the increase of real estate values in other portions of the city, where business buildings would be forced to go if skyscrapers were prohibited. Such sections are consequently left undeveloped with old and increasingly unsanitary buildings. The concentration of office facilities also produces a concentration in living quarters, with high rents and dark and unhealthful accommodations.

Skyscrapers themselves force a large proportion of their occupants to work under artificial light in rooms with poor or artificial ventilation, and they thus have, both directly and indirectly, a deleterious effect upon the health of the public.

WORKINGMEN'S APARTMENT HOUSES IN NUREMBERG

Exterior façade and interior court

RESIDENTIAL STREET IN BERLIN

When in the form of loft buildings, such structures intensify congestion in the regions in which they are located, and in addition produce congestion in the districts in which the workers live. This concentration of workers in poor quarters increases the cost of living, is unhealthy and leads to labor troubles.

While tall buildings thus enable a city to increase its population and are therefore usually encouraged by cities, it is the duty of the state to take measures to stop their erection, and to make such regulations as will distribute throughout the state the various industries and their workers and prevent the collection in cities of numbers of factories in the same line of work.

This may be effected by grading factories in accordance with the number of men employed and with the kind of articles manufactured, and limiting the number of each kind that may locate in cities of certain sizes. Such regulations will distribute over the whole state industries now crowded together and will afford suburban and semi-rural residences to all classes of workers, thus improving their condition and the productivity of the factories, and increasing the general welfare of the whole state.

Many large manufacturing concerns now voluntarily locate in cities distant from metropolitan districts, but the bulk of the medium and smaller sized concerns still collect in the large cities, producing a degree of congestion which has never before been equalled.

The regulation of the heights of buildings is, of course, only one of a considerable number of regulations enforced abroad. Among other important ones are those affecting the ratio of the area of the building to that of the lot, the separation of buildings, classes of buildings, classes of areas between buildings, minimum number of rooms in an apartment, window area, height of ceilings and cubic contents of sleeping rooms.

Representative figures are selected which, though in many cases not applicable to American cities, will give a good idea of the regulations in effect abroad.

The area of the lot which may be built over in cities in the Grand Duchy of Baden, the regulations of which are regarded as being very well worked out, varies according to the zone, from $\frac{3}{4}$ to $\frac{4}{5}$ of the total area. In the outlying districts, these figures are reversed, it being permissible to build only over from $\frac{1}{4}$ to $\frac{1}{5}$ of the total area of the lot.

In other cities the regulations vary, being about on the same basis, but always differing in accordance with the zone.

The buildings and the courts are divided into from five to nine different classes, and regulations are made to suit

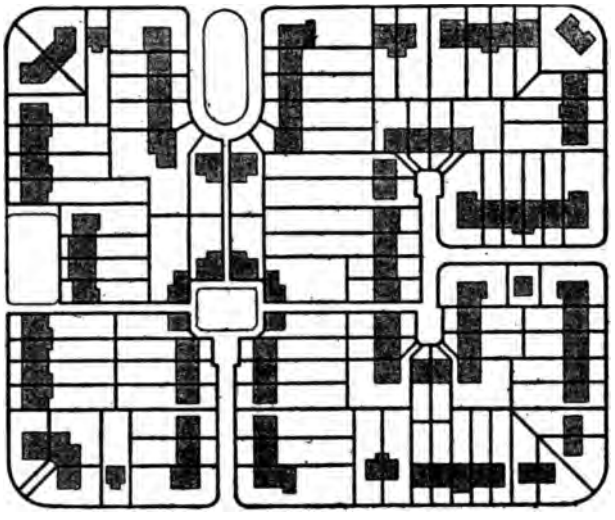


FIG. 52. A GROUP OF BLOCKS SUITABLE FOR A GARDEN CITY, WITH AMPLE OPEN SPACE AND INTERIOR COURTS

each class. Such regulations go into the greatest detail, so that no case is likely to arise for which a suitable regulation is not to be found. One fault with American regulations, such as have been adopted, is that in many instances they are of too general a nature, and difficulty is therefore experienced in applying them to the various conditions which arise in practice.

The regulations abroad in regard to the classes of buildings which are used as workingmen's homes require the apartment used by a family to consist of not less than three rooms, a living room, a sleeping room and a kitchen. The

living room is required to be of a certain size. In Wiesbaden 75 square feet, throughout Baden 107 square feet, in Karlsruhe, 130 square feet, in Mannheim 160 square feet, at the minimum. In the latter city, the kitchen must be not less than 130 square feet in area. There are also requirements as to the total area of the rooms, which in Düsseldorf, Magdeburg and throughout Saxony must be not less than 320 square feet.

The height of the rooms is generally placed at not less than 2.5 meters or 8.2 feet, while the window area must be from one-eighth to one-twelfth of the area of the floor, an average figure being one-tenth.

The minimum cubic contents of the rooms are also fixed by regulation at from 250 to 700 cubic feet, being in Baden 350 cubic feet.

The regulations as to space not built upon are sometimes based on the number of families occupying a building. In Altona 160 square feet per family must be left open in the main portions of the city, while in the suburbs, 1100 square feet per family must be left open.

Among other regulations are those in reference to light, there being provisions to the effect that certain windows of buildings shall receive light at angles of from 30 to 60 degrees over the walls of others, but these regulations are of a somewhat complicated nature and not easily applied. In London, the right of "ancient lights" has had the effect of causing theatres to be built practically underground, so that the highest priced seats are located in the gallery near the street level, and the pit is far below.

Regulations in some German cities extend to the styles of architecture. For example, in old cities which were once fortified, such as Nürnberg, all buildings within the ring or location of the old fortifications must be built in the fourteenth century style. This regulation preserves the individuality and atmosphere of the central portion of the city. In Dresden, in certain residential districts, a peculiar kind of iron fence of a certain height and design is required, which gives that portion of the city a decided individuality.

The whims of householders, thus, are not permitted to destroy the appearance of the city

In German cities most of the buildings are of a wholly or partially fireproof construction, and as their height is regulated and the fire department service unusually speedy, the greater part of the fire-escape facilities are confined to the form of wide, fireproof stairways. The public, in addition, is much more careful than our public and fires are thus much less frequent in occurrence.

In buildings in which the upper floor is 36 feet above the street, two stairways are usually required, though in exceptional instances one is permitted.

Every portion of a floor must be within 98 feet of a stairway. All stairways must go to the roof, or if the main stairway does not go to the roof itself, an auxiliary stairway at least $2\frac{1}{2}$ feet wide must be provided to the roof.

In many buildings, the stairs are in stairway houses, that is to say, alcoves or lean-tos at the side of the building, of a fireproof construction. The shape of the stair halls is regulated and under some circumstances no corner is allowed.

The regulations in the different cities vary to some extent. In some, buildings of more than two floors above the street floor must have two staircases, irrespective of their floor area. The main stairways must be not less than $3\frac{3}{4}$ feet in width, while stairs to the roof and basement must be 3 feet wide.

In schoolhouses all exits must be in courts with a minimum width of 30 feet for each 1000 children. Each schoolroom must have two exits. Stairways must be $2\frac{1}{2}$ feet wide for each 100 persons up to 500, $1\frac{2}{3}$ feet more for each 100 persons from 500 to 1000 and 1 foot more for each 100 persons upward of 1000 occupying the building. Thus for 400 persons, the width would be 9 feet, for 800 persons 16 feet, and for 1200 persons 21 feet. All stairways over 10 feet wide are required to have a railing in the center.

One familiar with German cities thus sees no fire escapes

PLEASING APPEARANCE OF LARGE MANUFACTURING BUILDINGS IN DÜSSELDORF AND BERLIN

Manufacturing plants located within or near the city should not be designed to serve utilitarian purposes only but should enhance the surroundings

DISTINCTIVE ARCHITECTURAL TREATMENT OF LARGE DRY GOODS STORE BUILDINGS IN BERLIN AND DÜSSELDORF

in evidence, and in the recent regulations of the building departments having charge of such matters, no specifications of fire escapes are to be found, all requirements on the subject being in reference to staircases, the principal items of which have just been outlined.

There are, however, numerous balconies, but they do not have the unsightliness of American fire escapes, as they are always decorated by flowers — another regulation.

The question of fire escapes in tall buildings in America is one of great difficulty. It is impossible, of course, to have a separate stairway from each floor to the ground, but with a single fire-escape stairway from a number of floors, the facilities are not adequate.

The form of fire escape most favored is that of the horizontal type; that is, some means of escaping into adjoining buildings. In buildings of a certain area, an excellent form of fire escape is to have the whole building divided by a fire wall from top to bottom, extending three feet above the roof, with suitable automatic doors. Fire in one side of the building cannot then communicate to the other side, while there is ample means of egress for all employees. Only half of an employer's business can thus be destroyed. A similar result may be obtained by fire walls between buildings, with openings in them closed by automatic doors, every establishment for manufacturing being required to be located partially in one building and partially in the adjoining one.

Not only are regulations applied to the construction of buildings in Germany, but also to the manner of their use, in order to prevent overcrowding. Children are required to occupy separate sleeping rooms and on reaching the age of twelve or fourteen years, each sex must also have its own separate sleeping rooms. Each apartment must be provided with its own toilet facilities.

There is a decided tendency abroad to provide individual houses in the suburbs for workingmen, and in England considerable attention has been paid to this subject. Often where it is not feasible to provide separate dwellings, two-

family houses are built. Some very compact and well-planned structures of a very low cost have been evolved.

In one design the upper floor is occupied by one large sleeping room and two smaller ones, while on the lower floor is a main living room which also serves as a kitchen and dining room, a scullery with a sink and a bath tub having a cover used ordinarily as a table, a small pantry, and, entered from out of doors, a toilet room and coal storage bin. The whole covers an area of 450 square feet. Such houses have neither garret nor basement, and the streets upon which they are built are constructed with the least expense, thus reducing the cost of housing to a minimum.

Colonies of such houses are often built for the purpose of housing employees of a large concern, such as at Port Sunlight, near Liverpool, a colony of workmen employed at the Sunlight Soap factories owned by Lever Bros. Such colonies are often in the form of garden cities, a detailed description of which will be given in a later chapter.

Similar colonies are frequently found in Germany, such as at Essen, where the employees of the Krupp Company are housed in a manner much superior to that employed in England. Among the features at Essen are chapels, convalescents' houses, homes for widows and widowers, etc.

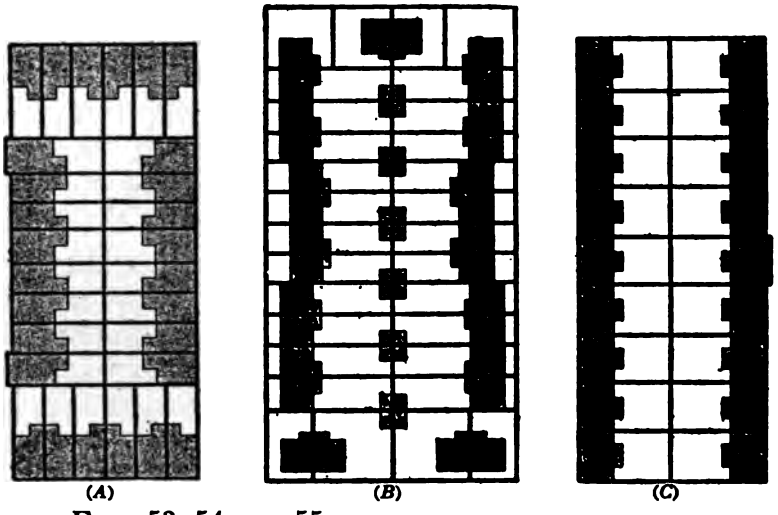
Many colonies are built by building and loan associations, under supervision of the government which prevents speculation and overcharging.

One of the most difficult of problems in connection with the design of buildings in congested or closely built-up blocks, is to provide light and air for the rear rooms. To obtain a suitable circulation of air is even more troublesome than to obtain the light.

A method adopted with great success for getting the direct circulation of air in blocks is to leave openings at the ends of the blocks, as shown in some of the accompanying illustrations, which are of blocks in English and German cities. The shaded portions represent the buildings, the black lines are the lot divisions and the white portions, gardens or open spaces.

In Plan A, the houses face all four sides of the block, but there are four openings at the rear of the houses on the ends of the block. Blocks of this kind are found in cities in England, Holland and in some German cities, notably Bremen, while an occasional New York block has sometimes one or more of such openings, left however by accident.

Plan C represents a block in which the houses only face the sides of the block. The breeze is free to sweep the



FIGS. 53, 54 AND 55. TYPICAL OPEN BLOCK PLANS

(a) Type of Half Open System, in England, Holland and Belgium. (b) Block with Partly Open Sides. (c) Block with Open Ends, as found in Mannheim and Posen, Germany

entire length of the block, there being no houses on the ends. Such blocks are required by ordinance in the cities of Mannheim and Posen in Germany.

Plan B is suggested as an ideal block by the Society of Architects of Berlin. The houses at the sides of the block are set back from the building line slightly, affording space for lawns. There is large free space at the ends of the block, thus giving ample air circulation for the entire block. It will be seen that the block is well laid out, with offsets in the façades of the buildings, affording a variety as compared with blocks having unrelieved straight lines. A succession of such blocks should prove highly effective.

While the heavy lines in the plans indicate property lines, the lots are not, as is so often the case in American cities, separated by tall board fences, shutting out light and air and offering opportunities for the collection of rubbish and the growth of weeds. The lots are separated by iron railings or with mesh netting fences, and with well-kept lawns and flower beds, the interiors of the blocks are in reality small parks, pleasing alike to all the residents.

Since, further, as in many German cities, the backs of the houses are treated in just as elaborate an architectural manner as the street façades, the view of the interior of a block is in every respect similar to that of a small public park, if not superior. There are thus no back yards in the American sense, with their ugliness and often squalor. In the interiors of the blocks are run narrow delivery wagon streets, a convenience very different from the alley of the western American city. As the interiors are planted with trees and have grass plots and flower beds as indicated, and as floral decorations are required by law on the window sills of the windows looking out upon such interiors, it will be realized that the block interiors in German cities have been developed to a point undreamed of in the United States.

Many other examples could be given of the means whereby European building regulations are used for the betterment of the public, but space will not permit. The subject is a most extended one and merits the most complete study by city officials who have the welfare of the public at heart.

CHAPTER XIV

GARDEN CITIES AND WORKINGMEN'S COLONIES

Principles of Garden Cities; Workingmen's Colonies; Social Facilities; Suburban Gardening; Housing Problems

THE almost invariable desire of the city dweller is to have a place in the country, where he may at least spend the summer months. The unrelieved monotony of city life, with cramped quarters, absence of healthful recreation and sultry temperatures on the one hand and the love of nature and the desire of owning a home on the other, draw people to the country. Only the lack of transit facilities and the time that must be lost from business, prevents a vastly greater proportion of the population from having their country homes and their plots of ground.

Living in the country is also cheaper as well as more healthful, particularly for children, who in the city never have the chance that they should have of developing robust constitutions.

Yet with proper regulation, it is readily feasible to provide rural homes for practically all who desire them.

To accomplish the greatest results, the location of factories should be entirely in the hands of the authorities. As long as private owners can save a few cents by grouping their plants together, crowded conditions in cities will continue, but when the general good comes to be considered and when factories must be located on the outskirts of cities and in rural districts, the mass of the population must of necessity be drawn out of the congested areas to find more healthful homes in the vicinity of their working places.

The concentration of factories also being prevented, the suburban and country homes of the workers would be of a

permanent character, without increasing real estate values compelling their abandonment.

The early adoption of such forms of regulation is, however, unlikely in the cities of the United States, so that except in the case of factories voluntarily locating in out-of-town districts, any remedies that may be suggested must depend upon self-interest for their adoption.

Among the plans which have been carried out abroad and in the United States to a limited extent are those of garden cities, workmen's colonies and suburban gardening.

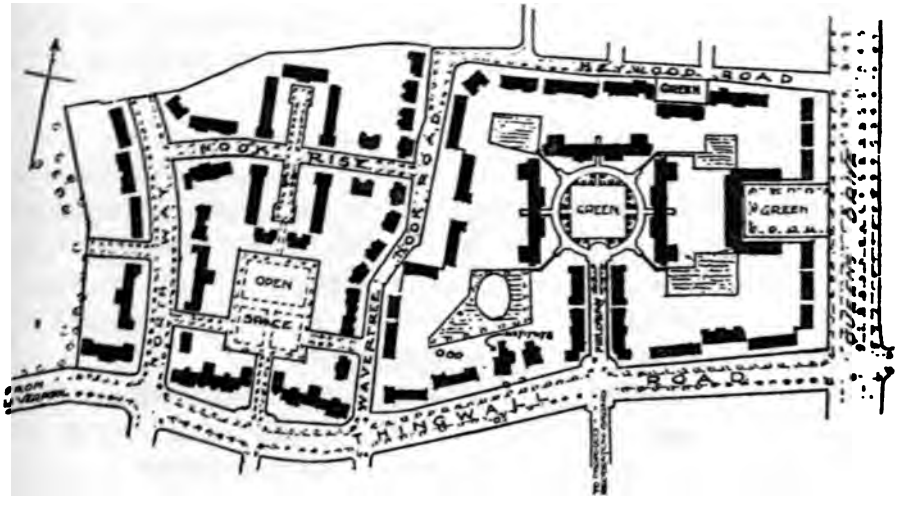


FIG. 56. LIVERPOOL GARDEN SUBURB OF TWENTY-FIVE ACRES, WITH ELEVEN HOUSES PER ACRE

The garden city in its best form is a well-organized development, in which from 100 to 500 homes make up a unit, which is intended to grow little if any larger. When additional demand springs up for quarters, a new garden city is formed elsewhere, and thus the identity of the existing one is preserved indefinitely, and the residents, in the expectation of spending their lives in their own homes, have every incentive to embellish them and keep their grounds in the best possible condition.

The garden city in plan should be laid out in the simplest yet most attractive manner. There being no traffic

of any consequence, the streets should be planned with the degree of irregularity which insures charm. Some of the streets should be winding, while the straight ones should have suitable terminals. Each house should be provided with a spacious garden, as it is from the gardens that such cities take their name. Such gardens, though partially devoted to vegetable raising, should also be well laid out with flower beds, and the whole garden city should be subject to such regulations as will insure sufficient attention being given to the gardens to produce the intended appearance. Grass plots, trees, hedges, shrubbery and arbors should be in abundance both in the front and in the rear of the houses. The neglect of the residents should not be allowed to mar the appearance of the city.

The houses may be quite simple and compact in design, such as have been described in the previous chapter, but they should all be individual in character, and by no means the frightful rows of boxes all exactly alike, which are put up for workmen's houses in most rural or suburban places devoted to such purposes.

The economical design of the buildings and the small expenses for streets makes the housing cost small, so that the rent may be low, or the workman may, in a reasonable length of time, become the owner of his own home.

Garden cities should be laid out within easy reach of transit facilities, and natural advantages of site should be seized whenever possible, to give individuality and charm to the plan.

The accompanying diagrams show plans of garden cities which have proven very successful from every point of view, but they should by no means be followed as patterns, for each garden city should have its own characteristics and be unlike any other.

The sanitary provisions of the garden cities should be carefully carried out, and the details should be simple but solid in construction and as inexpensive as possible.

A garden city is principally a place of residence, and it should have as few stores as possible, only those of the

most necessary character being provided. A school may be the only building of a public character.

In garden cities, however, which are larger and located in a more or less isolated position, the suburban character is lost and they become small cities and should be accordingly provided with a great number and variety of stores and public buildings. The city may have its own civic organization, with schools, a library, churches, museum, theatre and the like and be a complete civic unit.

Garden cities have met with greater success in England than anywhere else as yet, although a greater number and variety of them are now in process of formation in Germany.

The principal English garden cities are Port Sunlight, near Liverpool, Bourneville, near Birmingham, and Letchworth, near London, while the leading German garden city is Hellerau, near Dresden. The numerous workingmen's colonies in Germany which first began to be founded about 1863 are earlier prototypes of the present garden cities, but on a less comprehensive scale and with less open ground.

Garden cities are organized on several different plans. Port Sunlight is operated by a soap factory, the rents being placed on a basis of depreciation and taxes only, not taking into account the value of the land and the capital invested.

The factory regards this in the nature of profit sharing with its employees and the tenants are exclusively employees and their families. Port Sunlight covers some 450 acres.

At Bourneville the situation is different, and although half the tenants are of the employees of the concern, any one is eligible to become a resident. The rents are higher, but the place is an individual entity administered by an independent corporation. There are some 5,000 inhabitants in Bourneville who occupy 925 houses. The village covers 612 acres of land and one-tenth of the land in addition to that occupied by roads and gardens is reserved for parks and recreation grounds. In no case is the building allowed to cover more than one-fourth of the plot, and the number of houses is usually from seven to ten per acre.

The large amount of ground thus left open permits of vegetable gardens, the produce of which materially lowers the cost of living of the householders. It has been pointed out that the land as ordinarily farmed formerly brought a return of some $25 per acre, but that as now utilized it returns a product valued at some $150 per acre besides housing at the rate of 30 inhabitants per acre in the occupied portions.

Hellerau, which is some three miles from Dresden and which covers 325 acres, has a population of about 1,000, and the land is held by a corporation which limits its dividends to 4 per cent. The village is occupied by the employees of a single concern, the Deutsche Werkstaeten für Handwerkkunst, the chief owner of which, Karl Schmidt, is the leading spirit of the Hellerau improvement. The building is largely carried on by the Co-operative Building Association of Hellerau, which secures its capital at low rates from the governmental insurance funds. These enormous funds are thus utilized in a twofold manner; the principal for improving housing conditions and the income for the amelioration of the beneficiaries.

The garden city at Letchworth some 35 miles from London is a modern city of 7,500 inhabitants with 49 industries. It is an independent entity, and is operated by a group of persons who have limited their possible dividends to 5 per cent, thus ensuring the best of conditions for the residents. The maximum number of houses is twelve to an acre and two-thirds of the six square miles of the place are reserved for parks and similar purposes.

Another interesting example will be found in Forest Hills Gardens, Long Island, N.Y., a town planning enterprise in which certain trust funds have been invested; and which is conducted wholly on commercial lines as it is expected that a fair profit will be earned on the investment. As a real estate proposition it may not differ much from other first-class Long Island developments. It is not a garden city for workingmen, however, being intended for persons of ampler means.

The main points in the general layout or great ground plan are the direct, ample, convenient thoroughfares, the gently curved residence streets, so laid out as to allow for deep front gardens; the interior parks for private use of residents, and the large amount of land in proportion to the size of the development which is put aside for common use. Each block is considered as a unit and treated as such. This separate block planning gives a beauty and variety not possible with the ordinary rectangular block plan.

Unity of design is the special attraction of the Gardens, and this unity has been faithfully adhered to. The station, the inn, the stores, the apartments, and the houses large and small, while varying in treatment and material are all harmonious in design. The whole place has an atmosphere which is home-like, refreshing, and distinguished. Like all other high class suburban developments, the individual or free-standing house will predominate, but an attractive feature of the building plan is the so-called "Group Building." This plan makes it possible to buy a house of superior construction and enduring value at a lower price for the reason that the land can be used more economically when the houses are either semi-detached or one of a group of three, four, six, eight or ten houses set contiguously in a row. These groups and rows add greatly to the charm and variety of the building scheme. They have been planned so as to conform to the land and road contours and are of different sizes and prices, with varying interior arrangement and architectural treatment. There is no subject upon which the developers of the Gardens have laid more stress than upon the value of the common use of land as a factor in community life.

When the plans of this company were first officially made public, disappointment was expressed that the enterprise would not benefit the mechanic or day laborer, such as the English development at Port Sunlight. This, however, was impracticable owing to the location of the property, the initial cost of which would only permit of the upbuilding of a high grade residential suburb. The Gardens enjoy the

COURT OF WORKINGMEN'S HOUSES
Workingmen's colony, Friederichshof, at the Krupp Works, Essen

BUILDING FOR THE AGED
Altenhof colony at the Krupp Works, Essen

STREET IN WORKINGMEN'S COLONY, ALTENDORF
At the Krupp Works, Essen

distinction of being the first example in America of a town laid out in advance by a group of experts, and public interest in such a notable piece of work is well justified.

These examples indicate the scope of the garden city idea in its various applications, from the housing of the employees of a single factory to the establishment of an independent and thriving city.

The fundamental theory on which the success of the undertakings depends is in a general way the limitation of profits on the capital invested. The idea is now only in its infancy and there seems to be no doubt of its rapid development; indeed it is easy to imagine an enormous expansion of it, to include cities of great population, which should in time come to rival existing cities if not to deplete their population and bankrupt their greedy private owners. There can be no doubt in a city of 500,000 or 1,000,000 population in which the interest return was limited to 5 per cent on the land and building investment that living conditions would be so vastly better than they are in present cities, that the latter would suffer materially if not be left entirely stagnant. Thus the garden city may prove to be the city of the future and the practical means of carrying into effect the benefits of the single tax system.

The workingmen's colonies, which, as has been noted, were the prototypes of the garden cities, had their origin in the workingmen's quarters established by the Krupp Company at Essen, beginning in 1855 with barracks affording lodging and board for 200 men to start with, the erection in 1863 of a colony of 160 dwellings at "Alt West End," the first actual colony continuing with various additions to the present time until, with the colonies of Westend Nordhof, Baumhof, Schederhof, Cronenberg, Alfredshof, Friedrichshof, Margarethenhof, Dalhauser Heide, Emscher-Lippe and Colony Gaarden and the miscellaneous quarters in Essen, the Krupp Works house 12,800 men and their families, a total of 46,000 people.

The colony Cronenberg, the largest and best known, was mainly erected in the years 1872 to 1874.

The buildings are partly set up in rows of three-storied houses containing 30 to 40 dwellings in each block and partly form isolated three-storied semi-detached houses with twelve

FIG. 57. PLAN OF WORKINGMEN'S COLONY, DAHLHAUSER HEIDE, KRUPP WORKS

dwellings, six of them accessible from each gable front. The buildings are constructed in brick or quarry-stone without ornaments, and are surrounded by gardens and lawns. Throughout, each staircase gives access to six dwellings, to

two each on each floor from a small landing, through a private front door. The streets are lined with trees and in the midst of the colony is a spacious park, which in connection with the gardens surrounding the houses gives to the whole a pleasant aspect.

Subsequent to 1891, 204 additional dwellings were erected so that the entire colony contains 1,454 workmen's dwellings of two or three rooms and some up to six rooms.

From 1894 to 1899 the principal portions of Alfredshof and Friedrichshof were erected, and in the erection of these colonies æsthetic as well as practical and hygienic considerations were emphasized.

The plans on which the streets are laid out, the varying positions of the buildings as regards the streets, the providing of spacious open grounds, the application of a handsome and varied architecture, and the use of bright coloring in roofs and façades lend these colonies a lively and most pleasing aspect.

In fixing the ground plan of the several dwellings, allowance was made for the higher standard of the workman's life at present and accommodations of two rooms, therefore, were altogether abandoned, and sets of three or more rooms were only admitted.

Each one-family cottage was given a small garden and two or more storied houses were provided with verandas and loggias, to afford their inhabitants a sitting place in the open air. Each kitchen was also fitted with a larder.

The first lot of houses in Alfredshof was erected on the cottage system in one, two, three and four family cottages, in rows of a small number of houses per row.

To each family-lodging a small garden is attached. The dwellings in the semi-detached or double semi-detached cottages also are completely separated, each family having their own private entrance through their garden. At the entrance of each dwelling is a veranda.

In 1899 building in the Alfredshof came temporarily to an end. When it was resumed in 1907, the ground in the meantime had become too dear to continue the cottage sys-

tem. In order to utilize the building ground more rationally, and to provide a sufficient number of dwellings in the neighborhood of the works, in answer to the increased number of hands, a more compact mode of building had to be adopted.

The question could only be solved by the several-storied house let out in flats, which at the same time afforded the possibility of bringing the colony architecturally into some harmony with the town houses around. The houses were arranged in blocks, an arrangement already adopted in the Friedrichshof. By an artistic grouping of the blocks, by leaving sufficient open ground, lawns and playgrounds between and by carefully preserving existing trees this new part of the Alfredshof was made to answer all modern requirements as regards health and beauty.

The annual rents in these colonies are:

	In One-Family House	In Multiple-Family House
For a three-room dwelling	$47.50 to $55.00	$42.50 to $52.50
" " four-room "	62.50	55.00 " 60.00
" " five-room "	75.00 " 96.00	65.00 " 70.00

In opposition to the Altenhof and the older part of the Alfredshof this workmen's colony was from the very beginning erected on the system of the two or more storied house on account of the valuable and rather limited building ground. Six or four families enter their residence from one common staircase and three or two families have one laundry in common. But apart from the street door and the common staircase, each dwelling has its own private front door on the landing.

The three or two storied houses of this colony are united into more or less large blocks, which are grouped around squares and playgrounds, so that light and fresh air is abundant; the trees and shrubs besides afford a gay and pleasant aspect.

The Friedrichshof affords altogether accommodations for 523 families. The annual rents are:

For a flat of three rooms			$43.75	to	$52.25
" " " "	four	"	53.75	"	60.00
" " " "	five	"	63.75	"	68.75

In addition to the regular housing accommodations there are special structures for aged and infirm persons, widows, widowers and orphans, and there are also hospitals, convalescent homes and the like, affording complete accommodations for all classes of the population.

The Krupp Company, although the first to establish and

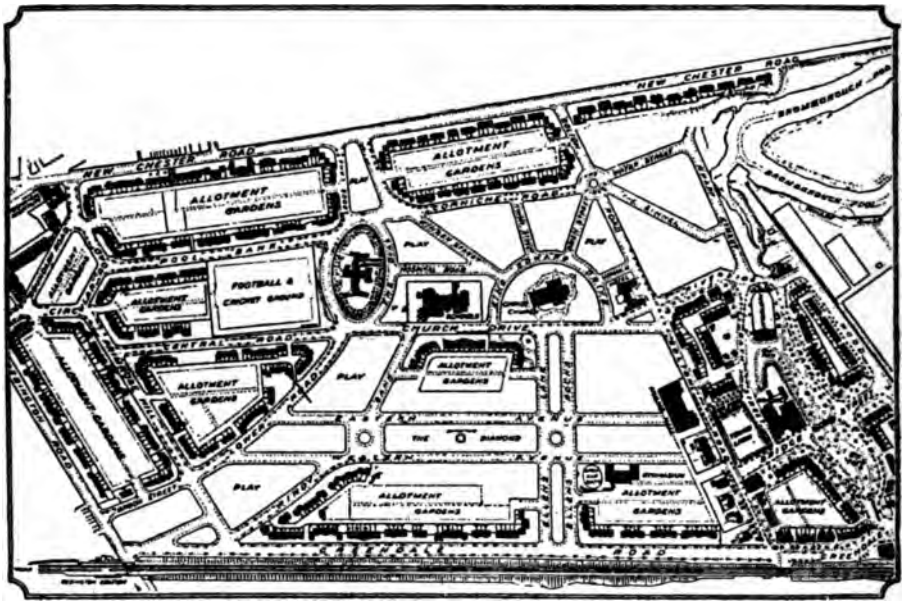


FIG. 58. GREAT GROUND PLAN OF THE GARDEN CITY, PORT SUNLIGHT, ENGLAND

the largest operators of such colonies, is by no means alone in the field, as numerous other German works have followed the example and all over Germany workingmen's colonies and garden cities are either projected or are already in existence.

A plan which affords a residence in the country during the summer months in an economical manner, is that of suburban gardening. The family living in the city rents a space in the suburbs within easy reach of the city and uses the garden for raising vegetables and as a more or less elaborate camping ground.

Either a tent or a simple summer house is put up, affording merely facilities for sleeping and cooking. The members of the family who are not compelled to go to the city daily, may thus spend the entire summer in the open air.

Such summer houses may be of the most inexpensive construction, but should be tastefully designed and pleasantly placed. They may with advantage be constructed of narrow vertically placed sheeting or lath, like pickets on a fence, the inner row spaced alternately with the outer row, so that privacy may be preserved while at the same time a perfectly free circulation of air is afforded. Such structures may be put up at an expense of not more than fifty dollars or so.

In the neighborhood of large cities on the seaboard, areas along the beaches are frequently devoted to small colonies of tents, which are used merely for sleeping purposes, food being usually obtained at near-by seaside restaurants. Such places, however, afford only the recreation of the beach and are without the advantages of the permanency and varied nature of suburban or rural gardening.

Care should be taken to procure pure water at such summer homes, since illness may result from carelessness in this respect.

Suburban gardens may readily be laid out with little or no expense near cities of any size, though they will prove most attractive near the larger cities.

In the garden cities and workmen's colonies in which residence throughout the year is permanent, a highly desirable feature will be the consumers' union, described in another chapter. None of the ordinary small merchants should be allowed to begin business in the city, unless they carry lines not intended to be carried by the consumers' union. In this way, the union will know just what demand it will have to supply and can make its purchases accordingly. Being operated for the benefit of the public, it is in the interest of the public that there should be no competition.

The consumers' union may be operated either by the corporation, by the building association or by the residents

themselves, but in any case it should be entirely in the interests of the public, as the plan of company's stores, where operated for the profit of the company employing the workman, quickly becomes a source of oppression and a breeder of discontent. Such stores are in bad odor in the United States and the practice is one which has been discontinued by many companies.

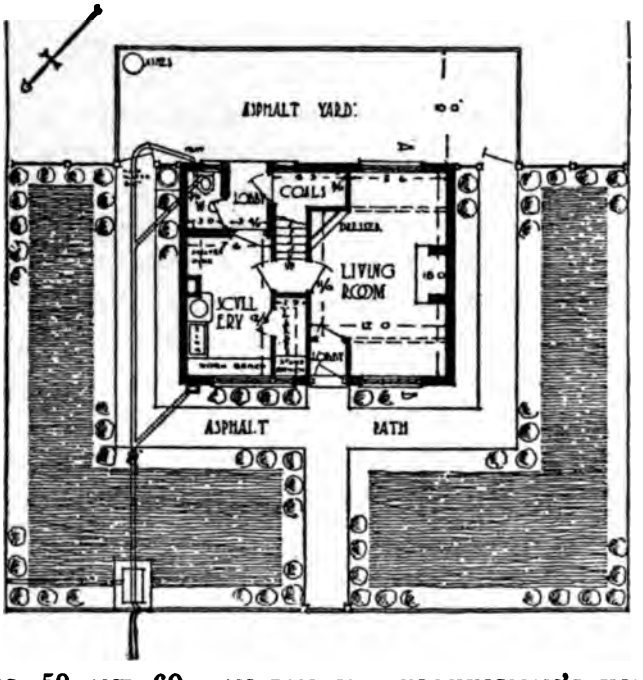
The interests both of the companies and of the workmen, where such company stores are still in operation, would be served by transforming them into consumers' unions.

In the absence of municipal regulation, companies which at present have their workingmen living in colonies, could accomplish much by supervising the grounds and gardens of their workmen's homes. By a system of small bonuses, depending on the well-kept condition of the grounds, or by a number of prizes, the men could be encouraged to improve their surroundings, and the interest thus taken by the employers in the workmen would beget a similar interest in the workman in his employer's work. The better understanding thus reached could not fail to be of mutual benefit.

One of the objections to garden cities and workingmen's colonies in the United States is the feeling of dependence that is implied. The individual seems to feel that by living in such surroundings he is making himself a chattel of the company. It is as if he were bound more securely in the chains of industrial servitude.

In Germany a wholly different feeling prevails. The workman takes a greater personal interest in his work; he expects to remain with the company a long period of years and he feels a sense of loyalty to the company's interests that is only felt in the United States by partners in the business.

To attain, therefore, the greatest success with garden cities, it is advisable to either give the employees a co-operative interest in the business, or to limit the number of employees in any one factory who may live in any one garden city, so that the garden city's population will be made up of employees of a number of different factories. This



FIGS. 59 AND 60. AN ENGLISH WORKINGMAN'S HOME IN A GARDEN CITY

would serve to free the workman of the feeling that he belonged too much to his employer.

As a rule it is best for the city itself to establish its own outlying garden cities, rather than to leave the matter to private initiative. A more comprehensive and better related system will result.

For such purposes, it is advisable for the city to acquire land, and while this is not feasible for American cities at present, owing to lack of constitutional authority, no doubt this condition will soon be remedied. German cities are large owners of land. Berlin owns some 40,000 acres, the greater part of which is outside the city limits. Munich has 14,000 acres and Breslau 12,000 or some 20 square miles. Such lands include forests, and German cities are among the largest owners of forests in the world, while additions are constantly being made to their belongings.

According to Mr. Frederic C. Howe, writing in *Scribner's Magazine*, May, 1910:

"Fifteen hundred small towns and villages in Germany derive so much revenue from the lands they own that they are free from all local taxes. Five hundred of these communities are not only free from all land taxes, but are able to declare a dividend of from $25 to $100 a year to each citizen as his share of the earnings of the common land."

The expropriation, thus, of lands likely to increase in value, is an obligation which the public owes to itself, and one which it should not hesitate to assume.

An excellent example of the extent to which a city may profitably go in solving the housing problems of its citizens is seen in the German city of Ulm, in Wurttemburg. The city is an important manufacturing center with about 56,000 inhabitants, and the municipality now owns 80 per cent of all real estate in and around the city.

The old fortifications were sold to the municipality in 1902, and the authorities immediately seized upon the opportunity to organize a very liberal city planning and housing system. When the inner walls were transferred to the city the ground outside these limits naturally rose in

value. In view of the city's great undertaking, combined with the large outlay in buying the fortress, for razing and removing the walls, and for the building of many new streets, the authorities had decided that these improvements could be made on the sole condition that the city treasury and not the former proprietors of the land should benefit by the great rise in real estate. With this object in view the town council began buying up land as early as 1891. At the close of the year 1908–9 nearly 1,210 acres had been purchased at a total cost of $1,398,640. Of this land 405 acres had been sold for $1,623,924, so that the municipality had profited $234,284, and still owned 805 acres. In addition, the disused fortress, covering 172 acres, was bought for $952,000 and $595,000 was spent in purchasing houses in the old part of the town in order to improve sanitary conditions. In all, the city now owns 4,942 acres.

The principal points in the plan for developing the city were: To make direct roads from the gates of the old wall to the main roads leading to all parts of the country; to connect the suburb Soeflingen by direct new thoroughfares with the city proper; to build boulevards within the walls; and to build a freight station west of Ulm within easy reach of the city.

It then remained to divide and parcel out the land, which was done as follows: The valley between Ulm and Soeflingen was reserved for all kinds of trade, small industries, and dwelling houses for the general population. In order to economize space, it was decided to build in rows, with space between the buildings. For large manufacturing plants, land was reserved east of Soeflingen, connected with the freight station by a railway line constructed by the town. The same will be done east of Ulm. For workpeople and peasantry of the suburb Soeflingen, land was allotted in the northeast of Soeflingen — the houses to be built at intervals of 17 feet; for ordinary family houses, the hill in the south of Soeflingen — the houses to be 23 feet apart; for villas and more pretentious houses, the hill west of Ulm with houses at intervals of 33 feet; for people of the more

prosperous class, the "Michelsberg," a sunny hill north of Ulm — distance between houses to be 147 feet. The woods east of Ulm afford ample opportunity for recreation and sport. Land east of Frienrichsau, near the Danube, has been reserved for a future harbor.

Extensive ownership of land enables the city to keep prices within reasonable limits and to furnish land at a very moderate rate for undertakings of public interest, for manufacturing purposes, houses for workmen, etc. Persons purchasing land of the city must agree to build on it within a given number of years, the city having the right to buy back such land at the price originally paid for it, including 3 per cent interest. Ground for the erection of workmen's houses can always be had at a very moderate price, but solely on conditions excluding personal profit or speculation.

The city itself has built 175 houses with 291 flats for 1,367 inhabitants on the following conditions: the city builds the houses and the purchaser pays the net price, 10 per cent down and the rest at 3 per cent interest and 2 per cent on mortgages. In order to secure for the future low prices for the houses and low renting, the city is authorized within 100 years to take back the houses at the original purchase price if the owner is unable to pay the interest; if he does not live in the house, but sublets it; or if he wishes to sell the house.

Other houses built under the foregoing conditions have been erected by companies, societies, etc. The Society Anonyme Wohnungsverein has constructed 18 buildings, with 62 flats, at a cost of $53,274. Flats of two rooms rent for $41.65 per year, while three-room flats, with kitchen, etc., bring $57.12. Shareholders are restricted to 4 per cent interest on their capital. In houses built by the Savings & Building Co., two-room flats rent for $52.36 and three-rooms, with kitchen, etc., bring $59.50 to $90.44. The Unlimited Building Co. builds houses for letting to members. The ground remains the property of the city, which after 70 years is obliged to buy the houses for 80 per cent of the building value. The houses contain 5 to 10 rooms and cost $3,808 to

$7,140 without ground. The Kingdom of Wurttemberg, the postal administration, and several industrial works have built houses for employees. Altogether, since 1891, 388 buildings, with 1,006 flats for 5,000 inhabitants, have been built on condition that the letting price cannot be increased whenever the price of land rises.

CHAPTER XV

CIVIC CULTURE

Schools; Churches; Theatres; Museums; Art Galleries; Libraries; Concert Halls

THE planning of a city includes not only the arrangement of its streets, the construction of engineering features and the erection of public buildings, but also the provision for such structures and systems as may be better performed by the city as a whole than by its individuals, and which are intended for the purpose of inculcating that degree of civic culture which will enable the citizen to understand and appreciate and enjoy the advantages provided by the city.

Such factors of civic culture include schools, libraries, art galleries, museums, theatres, concerts and the like, and the city should not only erect suitable structures for these purposes, but should, where supplementary systems are conducted by private interests, regulate them in such a way as to cause them to take a proper place in the city's scheme.

Schools should be so located as to be accessible to the pupils and sufficiently numerous and so placed that the pupils have but short distances to go to reach them. School buildings should, of course, be provided with ample light, ventilation and heating facilities. Playgrounds of ample capacity should be set apart, and staircases should be wide enough to afford easy access to all schoolrooms. As obvious as these requirements will appear, it is nevertheless true that great numbers of schools do not meet them.

High schools, normal schools, institutes and city colleges, as they are comparatively few in number and attended by pupils often living at a distance, should be located at centers of traffic. The buildings should be of a monumental character on sites with suitable grounds or approaches. Such

buildings thus become part of the city's plan and their dignity and imposing character favorably affect both the pupils and the general public.

Art galleries and museums should also be provided by the city. Although philanthropists often find in such buildings a means of contributing to the public welfare, it is nevertheless a duty which a city should not neglect in the expectation of such benefaction.

Such structures should, of course, be of the highest æsthetic significance, and should be located in open squares or

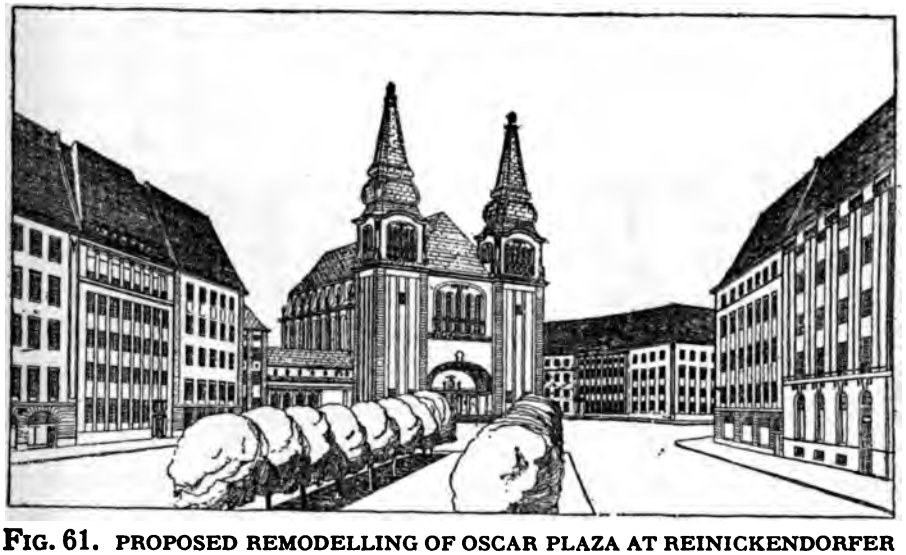


FIG. 61. PROPOSED REMODELLING OF OSCAR PLAZA AT REINICKENDORFER STREET, BERLIN, WITH A CHURCH AS A FOCAL POINT

parks, and though accessible to traffic, they should be somewhat removed from the main avenues of turmoil.

Libraries and concert halls should likewise be monumental structures, with proper approaches, but they should be located convenient to residential traffic.

Since in order to produce the best effects of city design, commercial and private buildings must be subject to municipal regulation, it is also necessary that a similar control be exercised over churches. While in the United States, a complete separation of church and state exists, and the interference of a municipality with the affairs of a church may

be resented, as much by the non-religious part of the community as by the membership; it would be ridiculous not to require the conformation of buildings of usually such a prominent character with the plan of the city.

Churches may indeed, in many cities, owing to their tower-like structure, be utilized as objectives at focal points and otherwise be made distinctive features of the city's plan. When great churches are to be erected, they should only be allowed to be placed at such localities as will cause

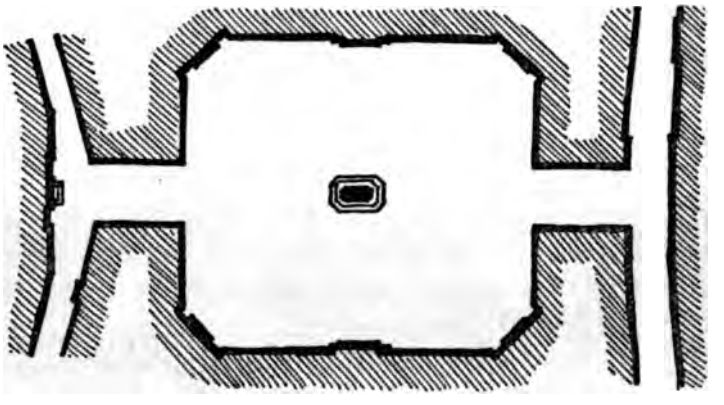


FIG. 62. VENDOME PLAZA, PARIS, A SQUARE WITH BUT TWO ENTRANCES, THE CENTER OF WHICH IS OCCUPIED BY A TALL COLUMN

them to best harmonize with the city's plan and produce the greatest effect.

Inasmuch as churches are the beneficiaries of the state to the extent that they are free from taxation, it is appropriate that they should be so erected as to best harmonize with the city's plan. If churches paid taxes and the money was devoted to the embellishment of the city, some very important improvements could be made, which are now foregone.

Theatres are another class of buildings which should be of a character adapted to embellish the city, and to beautify the localities in which they are placed, and the same is true of opera houses and privately owned concert halls.

The influences of the theatre and music are among the most important of the cultural agencies, and the added dignity and prestige to such arts of being located in monu-

mental structures would augment their effects and amplify their usefulness.

In the state and city owned theatres of European countries, an excellent example is set for other countries, as such theatres are an artistic inspiration both to the public and to the artists. This state and civic sanction and support places the work of the theatre on a higher plane, and such recognition of its value and importance stirs its personnel to great endeavors and gives its work added authority with the public.

FIG. 63. PLAN OF THE CATHEDRAL AT ULM

An excellent example of the location of a prominent church as the focal point of a number of streets

A state or municipal owned theatre will obviously be of a monumental character, as the question of expense does not restrict the design or location of the building. Such a theatre will be so placed as to be an ornament to the city and the center of its amusement district. The commercial theatres may be arranged with reference to it and in some instances it may be feasible to have such structures arranged about a square or small park. With the setting of the trees, lawns and fountains and an artistically planned system of illumination, an especially interesting feature of the city would thus be created.

One of the leading examples among American theatres of a monumental character is the present Century Theatre in New York, formerly called the New Theatre, which faces Central Park, but which enjoys only a fairly good location.

Occasionally a theatre with an admirable exterior will be found, but its surroundings are usually such as to detract from whatever beauty it may possess. American theatre interiors, however, are usually of a much more pleasing effect than the exteriors, and the comfort and enjoyment of the audience, once inside, is well provided for. The high cost of real estate, however, usually forces the theatre into the interior of blocks, with only a narrow and ugly street frontage. This circumstance, however, is not so discouraging to

CITY THEATRE, FRANKFORT

OPERA HOUSE, FRANKFORT

Municipally fostered enterprises for the promotion of civic culture, not managed by the city, but given subsidies amounting to $75,000 annually

the æsthetic sensibilities of the public as might be the case if the civic culture of the public had been developed to a greater extent.

The results of the æsthetic and ethical influences which go to make up what may be termed civic culture, are of such importance to the city and its public, that the greatest encouragement should be given to such subjects. The results obtained in European cities, the beauty and effectiveness of their plans and operations, indicate what may be accomplished in America, where the results will in time, when the public is fully awakened, undoubtedly be much greater, since the wealth and natural resources to be drawn upon are so much more extensive.

The trend towards civic culture is inevitable, though slow, and an example of it is seen in the gradual absorption by America of the greatest of the works of art of Europe, the cultural effect of which will be exerted upon future generations of this country's citizens rather than those of other countries.

In the presence of such great examples, it behooves us, however, to create our own schools and develop our own talent, and in every possible way to promote the civic culture of the whole body of citizens.

CHAPTER XVI

ADMINISTRATIVE FUNCTIONS

Hospitals; Poorhouses, Lodging Houses and Rescue Homes; Orphan Asylums; Homes for Widows and the Aged and Infirm; Police and Fire Departments

AMONG the functions of the administration of a city are those which relate to the care of the unfortunate, the guarding of persons and property, the correction of the delinquent, the prevention of extortion and the enlarging of the ideas of civic duties, and the supplying of the public with various commodities which cannot otherwise be so advantageously obtained.

A city should be provided with an ample number of hospitals, either of city, private or denominational foundation, and when such hospitals are not controlled by the city, the city should at least have a considerable degree of jurisdiction over them, particularly as most hospitals are tax exempt. As cities are not usually provided with ambulances, and there is thus no official means of caring for those who may meet with accident or sickness on the streets, it should be the duty of each hospital to care for the stricken on the streets in their locality.

The entire organization of hospitals in the United States is one which is founded largely on false assumptions and conducted without a proper conception of the true relation of the hospitals to the public.

A great number of hospitals are founded on an insufficient endowment fund and are constantly appealing for possible philanthropic aid, and at the same time charging patients for the service extended, usually much more than it is worth. Thus though the recipients of charity on one side, they employ it, on margin so to speak, on the other, to

enable them to have a larger plant than they can readily afford in order to accommodate more paying patients. Unless the patient is willing to pay a high rate, equivalent to that charged by doctors in private practice where expenses are larger and charges naturally higher, he is regarded as a charity or semi-charity patient, and suffers offense and humiliation in a psychological sense and very likely an inferior degree of attention and service in physiological sense.

This is all entirely wrong. A hospital operated on funds donated by a philanthropist is no more a charitable institution than a university which is supported by an endowment given by philanthropists. The sons of the wealthy attend universities and enjoy the benefits of such philanthropy without the stigma of being charity students, but hospitals, operating under exactly similar conditions in treating patients, assume that they are dispensing charity. As a matter of fact, philanthropists are actuated more in making such donations by a desire to perpetuate their own names than by motives of charity, and the manner of use made of their funds by many hospital authorities is such that public policy would be better served by making all hospitals purely municipal in character.

In any event, hospitals should be subject to a close degree of municipal supervision, and such practices as are improper should be prevented, such, for example, as the transferring of persons in a dying condition to municipal hospitals from the semi-philanthropic hospitals in order that the latter may show a lower death rate. Denominational hospitals, also, as a condition of their establishment, should be required to admit patients without regard to creed.

The health of its citizens so largely concerns the city that hospitals should be compelled to recognize the requirements of public policy and be brought to realize that in no possible sense are they dispensers of charity.

The location of the hospital buildings should be as determined by the city authorities, and they should be of such size as to accord with the plans of the city. The structures should be properly laid out, of fireproof construction, and

situated in suitable grounds, which should partake more or less of the character of small parks.

Comparatively few hospitals, however, should be located in the city limits. Patients suffering from chronic complaints and convalescents should be in hospitals in the country or at least in the suburbs, both for their own benefit and on account of the lower investment required in building the hospitals.

The same is true of relief institutions such as orphan asylums, homes for the aged and infirm, widows' homes, rescue homes, poorhouses, and asylums for the deaf and dumb, feeble-minded and insane.

The duty of the municipality and the state towards these classes is one that deserves the most complete performance, not only in their own interests, but in the interests of the public at large. Institutions of such character are best located, as has been said, in the rural districts, as the room they occupy in cities can be much better used for other purposes. They should, of course, be subjected to the most rigid supervision by the authorities, not limited to occasional visits of trustees, since abuses quickly arise and are difficult to check. Particularly should institutions of a rescue character to which inmates are legally committed but which exist by private charitable donations, be subject to supervision, as such inmates are often detained rather for the purpose of enabling the staff to have an excuse for appealing for funds and drawing salaries than for the good of their charges or the public.

In the protection of persons and property and the punishment of delinquents, the city performs one of its basic functions, and one in which the efficiency attained varies widely. The administration of the police is one of the most difficult, if not the most difficult executive function which city officials are called upon to perform.

The principal defects in the American police system arise from the fact that the force is recruited from an untrained class of men and the chief police officials are not sufficiently experienced. This springs largely from political causes, and

the efficiency of the police will only be obtained when political considerations are relegated to the background and the personnel of the force improved.

In Germany, for example, practically all policemen were at one time non-commissioned officers in the army, and very seldom is a recruit accepted who did not rise at least the first step out of the ranks. The body of men is thus one used to discipline and organization. The higher police officials must have been officers in the army, and as they make a life business of civic administration, they prepare themselves in a general way during their educational careers to become administrators, either as mayor, paid city father, police commissioner, postmaster or in other like capacity. As such, when they have made a reputation in one city, in whatever capacity, they may be called to other and more important cities, building up reputations for themselves and moving from place to place as do high executive railway officials in the United States.

With organizations of this character free from political influence, municipal regulation has teeth in it, and means all that it stands for. It is one of the fundamental causes of German civic superiority.

The proper maintenance of order is an administrative function but little understood by the American police in general. They do not appear ever to have been instructed what real order on the streets means. Streets are for the purpose of enabling the public to get from place to place in safety and with convenience and despatch, and not for the various other purposes to which they are put.

Among the things which should be prohibited are the assemblying of groups of loafers and mashers on corners, spitting and throwing refuse on the sidewalks and making remarks about passers-by; the noisy playing of boys on the streets, shouting and loud singing on streets, roofs and buildings, and the playing of bands and pianos after certain hours; the shouting and singing of roysterers and college boys in the early morning hours; rowdyism in the streets and on cars; the calling of hucksters and others; the assemblying on side-

walks and streets of crowds attracted by window displays or baseball or bulletin boards; the congregation of beggars or others soliciting contributions, including bands of instrumentalists; and the parading and gathering on the streets and sidewalks of bands of music and exhorters, both black and white, including those belonging to organizations or issuing from neighboring buildings and whose music and haranguing are likely to be highly distasteful to others on the streets or in the adjoining residences.

Other notable nuisances which should be prohibited are noisy vehicles, particularly automobiles with shrieking horns and smoking engines; flat-wheeled trolley cars; blasting during the erection of buildings and the operation of donkey engines except during certain hours.

Nuisances of this character are readily prevented when the police are instructed on the subject and are required to carry out their instructions.

It is certainly not the part of wisdom to construct a beautiful city and then have its advantages impaired by the improper use of the streets. The streets belong to the public as such, and not to individuals with time to kill and axes to grind, and such usage should be promptly stopped.

Police administration buildings and municipal courts should always be of an imposing monumental character, and they may properly form the nucleus of civic centers. As objectives at focal points, they are highly effective. On account of the psychological effect produced and for the purpose of civic embellishment, no expense should be spared to give them every possible degree of importance and interest.

In the fire department service, American cities are placed at a somewhat better advantage than in the police service, since politics enters much less importantly into the question. The firemen themselves are brave and capable and produce the best possible results with the more or less antiquated equipment placed at their command.

It is in this department, and in the administration of the service, that American fire departments are inefficient.

Abroad, the heads of departments are either trained engineers or administrators, and if not engineers, they are assisted by advisory engineers. The highest degree of technical training is thus brought to the service of the departments, for such men make the subject a life study.

The American public, reading only the stories of heroism of the individual firemen, is not aware of the true conditions existing in the departments, and how behind the times the equipment and appliances are. Even when our reforms do come, they come in a most belated fashion. When we are beginning to adopt automobile fire engines, as at present, such engines are being discarded abroad, in favor of electric engines.

The United States Consular report of August 9, 1911, states:

"The city of Berlin has also adopted electricity as a motive power for their fire department, four stations being already fully equipped, horses and gasoline motors being dispensed with. Among the many advantages of the system was a saving of over half the cost where horses had been used, also a wonderful saving of time, it taking but 12 seconds from the time an alarm was sounded until the department was fully under way on the street. Safety and simplicity of operation were also fully demonstrated."

The antiquated methods and fire apparatus of many cities should be thoroughly overhauled. The fancied superiority of the departments and the self-satisfaction displayed should be promptly exploded. Often the system of fire alarms depends on a single center of distribution for a whole city or borough. It is as though the whole telephone system were centered at a given point. Surely there should always be a distributing system, so arranged with different centers that one or several might be eliminated and still leave means of communication between the remaining centers effective.

In outlying districts particularly, the fire alarm wires are exposed and subject to damage and interruption, and they are so frequently interrupted that from the statistics

kept in New York, for example, an average may be struck as to how many interruptions may be expected to occur during any given period.

Not only are fire alarm systems defective in this particular but the methods of ringing alarms is such that there is much time wasted in starting to the fire. The alarms should appear instantly, as annunciators in hotel room signal systems. Often the horses are hitched and the engines ready to go and waiting for the alarm to be completed before being able to tell where to start for.

Horse-drawn engines are scheduled to disappear in five years, it is claimed. This will be just about fifteen years behind the times and will represent a loss of untold millions in property.

Throughout the details of fire fighting, the systems are either out of date or modern devices have not been adopted. For example, the fireman's helmet, which is connected with an oxygen supply and a water supply, is not in use. Clothed in a fireproof suit, and with water pouring over him from such a helmet and supplied with oxygen, a fireman can literally pass through flames, while smoke is no obstacle whatever.

A few of these in use in fire departments would be the means of saving a great number of lives every year, of those who, overcome by smoke, cannot be reached by firemen as at present equipped. No amount of heroism can take the place of such an apparatus. Doubtless some of them may be expected to come into use in five or ten years.

The enormous damage from the use of too much water is another serious indictment of our fire fighting methods. Except in cases of conflagrations or where buildings are gutted, the water damage is unnecessarily great, and often is greater than the damage from the fire itself. Not infrequently fatalities are due to drowning in flooded basements, rather than to suffocation.

The great consumption of water in American cities as compared with foreign cities may be seen from the following examples taken at random:

ENTRANCES TO GREENWOOD AND CYPRESS HILLS CEMETERIES
BROOKLYN, N. Y.

NATIONAL MAINE MONUMENT, CENTRAL PARK, NEW YORK

Memorial to the officers and men who lost their lives on the battleship "Maine" at Havana

Pittsburg, 220 gallons per day per capita; Buffalo, 310; Philadelphia, 205; Chicago, 225; Salt Lake City, 310; Paris, 65; London, 39; Amsterdam, 37; Copenhagen, 27; and Berlin, 22. Even with these small amounts, the foreign cities have their streets and sidewalks flushed regularly. The American excess is due to the inefficiency of the city authorities.

It is the boast of American fire chiefs that they manage to flood buildings with certain enormous quantities of water. This is a boast of inefficiency. Abroad the fire chief reports how few gallons he was able to use to put out the fire. There, apparatus is used which throws the water in thin sheets under high pressure, and extinguishes the fire without flooding the lower floors, or in fact, in many cases, even wetting them, as it is evident that a small volume of water under high pressure will put out a fire more effectively than a mere flooding of the floor. Smaller hose is generally used, which makes it more available, while every modern device for fire fighting is also employed.

One device which might be adopted with great benefit in many American cities is the endless bag fire escape, reaching from a window to the street, the lower end being held some distance away from the building. Thus a person sliding down inside the bag, shoots out at the bottom in a horizontal direction, instead of dropping vertically as down a rope.

The reason for not adopting the small hose high pressure system here is that it has been "tried" and found impracticable. Perhaps the fact that it was not practicable was due to the fact that there were no "practical" men behind the companies seeking to introduce the system, since the same objection has been urged against automobile fire engines, which are only now beginning to come into use, though they have been used abroad for ten years, and are now being discontinued in favor of the electric engine. It is alleged that they have not proved as reliable as the horse, yet as operated abroad, they have proved more reliable, speedy and efficient.

The great extent of the fire losses throughout the country is rarely understood by the public. Yet in the failure to take ordinary precautions against fire, and in carelessness and faulty construction, losses amounting to three-quarters of a million dollars a day are incurred throughout the country.

The excessive and wasteful use of wood in buildings is largely responsible for fires, and wood is used because of its apparent cheapness. Ultimately wood is a high-priced building material, since its true value, in the first place, is much higher than the selling price, and its durability is so much less than other materials. The failure to renew forests and the sacrificial price at which wood is sold, representing only the cost of getting it to market and not the cost of reproducing the forest crop, has resulted in the erection of a large number of buildings of an inflammable and quickly deteriorating nature. If wood were selling at its true value and proper building laws were in force, both of which would be the case under efficient administrations, the forests would be conserved and the great loss of fire largely prevented and a double result of inefficiency cured.

Fire losses abroad averaged, per capita for six principal cities for a period of five years, 33 cents per year, as compared with losses of $3.02 per capita in the United States. It will, therefore, be seen that American cities should adopt the most urgent measures and install every possible facility for fire fighting and prevention.

The subject is most intimately connected with city planning, as with the erection of finer buildings, the duty of guarding against fire becomes greater. Their fireproof character, however, is likely to minimize fires, so that if the departments are provided with suitable equipment, the number of firemen will not have to be increased, and may even be reduced without relaxing the degree of vigilance which should be exercised.

The yearly losses according to the records kept by the *New York Journal of Commerce* for the United States have been in the last sixteen years as follows:

1912	$225,320,900	1904	$252,554,050
1911	234,337,250	1903	156,195,700
1910	234,470,600	1902	149,260,850
1909	203,649,200	1901	164,347,450
1908	238,562,250	1900	163,362,250
1907	215,671,250	1899	136,773,200
1906	459,710,000	1898	119,650,500
1905	175,193,800	1897	110,319,650

It will be noticed that the losses though varying greatly from year to year have more than doubled during this period of time, a condition of the most disquieting nature.

The question of fire alarm and police alarm signal systems was considered in the earlier chapter, "Streets up-to-Date."

To what extent municipal regulation amounts to in German cities may be seen from the following as reported in *Municipal Journal* of January 2, 1913:

"Police regulations which are to be put into effect in Berlin, April, 1913, will bar whistling and cane swinging and prohibit persons walking more than three abreast on the streets. Copies of the regulations include these and other usual restrictions as follows: Persons may not walk more than three abreast or stop or congregate for any extended period of time. Persons with umbrellas or walking sticks must not carry or swing them in any manner likely to imperil the safety of passers-by. No windows or doors of houses, flats, shops or restaurants in which music is being played may be kept open. No whistling, singing, shrieking, shouting or loud talking of any kind likely to endanger the quiet of the streets is to be permitted. Teamsters in charge of wagons, trams or trucks loaded with resounding metal of any kind are forbidden to drive in a manner calculated to cause nerve-shattering noises. No paper, remains of fruit, cigars or cigarettes may be thrown into the streets. The dragging of clothes of any kind — women's dresses or anything else capable of producing dust — is prohibited."

Numerous other novel features of importance in use abroad might be mentioned, but the subject is so extended

as to be beyond the limits of the present volume, if indeed too much space, comparatively, has not already been devoted to it. Anything, however, which can be said to bring about European conditions, in which the losses per capita are only one-tenth of our own, is certainly not superfluous. If we had nine-tenths of our fire loss to spend in beautifying cities they could be indeed made to bloom. It may be in the saving effected in fire losses abroad, that the cities have the surplus necessary to devote to the subject, for certainly in natural resources their situation is not as good as ours and why they should have funds available for city improvement when we have not is not very obvious.

CHAPTER XVII

COMMUNAL INDUSTRIES

Municipal Markets; Co-operative Markets; Municipal Slaughter Houses and Ice Plants; Public Baths; Stimulation of the Co-operation of Small Manufacturers; Central Manufacturing Plants for Co-operative Industries

THE civic impulses which evidence themselves in improved and beautified buildings and streets are not satisfied merely with æsthetic progress, but are also shown in plans for improving in a direct and practical way, the living conditions of the whole city.

Among such improvements are various forms of communal industry, such as municipal markets, municipal slaughter houses, municipal ice plants, municipal baths and municipal manufacturing facilities for small industries.

One of the most important of such activities is the municipal market. Such markets are best conducted by a board of managers, whose duty it is to conduct the entire undertaking.

The principles upon which such institutions are conducted are to buy at the most favorable times, to buy in bulk at the lowest price, and to sell at retail at the lowest possible prices, without showing any profit above overhead charges and running expenses, which include all salaries, maintenance and insurance of market and goods and other expenses incidental to the enterprise.

As the managers buy in bulk and as they have the city's credit and ample cash capital at hand, they obtain their goods at the most favorable prices and discounts. The public is also assured of the quality of the goods and of perfectly fair treatment from the managers of the store, who are, in effect, to be considered the servants of the public.

Such municipal markets should be well located, with easy access from all parts of the city, and if this is not feasible, a number of branches should be established. This enables a whole city to be supplied with produce purchased in a single bulk.

There should be in such markets different departments, as for meat, fish, vegetables, fruits, groceries, dairy products, etc. Such a market should occupy a block or so of space, with an interior court into which should run a railroad siding, as well as a wagon way for delivery wagons. All loading and unloading should be done in the court and not on the sidewalks.

When enterprises of this kind are not undertaken by municipalities, every encouragement should be given to the organization of consumers' unions, or large associations of private consumers. Many such associations exist abroad. In Germany alone, there is a central consumers' union, with over 2,000 branches. Very large associations of practically the same character exist in England.

The local members of a consumers' union pay annual dues of about five dollars. The members at their annual meeting elect directors and officers to carry on the work. The officers may only act in a supervisory capacity over paid employees, or they may act as managers, making it their whole business and receiving salaries for the work. The members also hold monthly meetings, and discuss the work of the officers of the union, market prices, methods and complaints.

The central body of the unions issues a weekly bulletin, or newspaper, which is a quite important phase of the movement. It gives the market prices, general news of interest to members, discussions and reports of the work of the various local unions, comparing their methods and showing how improvements may be made. Numerous cooking receipts are given, of a timely nature, showing how to utilize the foods in season at such times to the best advantage. It also gives information as to the condition of crops and indicates which foods are likely to be plentiful and

which scarce later in the season. It tells the proper time for placing orders for foods and supplies so that the consumer may order at the most favorable moment. Not only the current prices are given, but also the probable prices at later periods of the year, based on the supplies in sight and the natural increase and decrease. This enables the consumer to determine whether to lay in supplies or wait until conditions change. It acts as an incentive to careful management and keeps the consumer constantly informed on subjects that he would ordinarily fail to give proper attention to.

The placing of orders by members at the proper time facilitates the work of the unions, since it enables them to gauge the probable demand of their members and to place orders for the required amounts, thus saving any risk of an over or an under supply.

The unions, knowing what the requirements of their members will be, are able to place orders at any time for certain amounts of various commodities, to be delivered later in stated quantities at stated intervals and agreed prices. Thus the consumer knows in advance what he will have to pay and when he will have to pay it.

A characteristic consumers' union store often consists of a large one-story building of the character of a market house, with a large open space in the center. Around the sides are arranged various counters, devoted each to a separate class of commodities, a counter for meats, one for rice, flour, etc., another for fruits, another for vegetables, another for wines and liquors and others for clothing and haberdashery, as the consumers' unions also include wearing apparel as well as foods and household commodities in the articles dealt in. Even bicycles and hardware, dishes, cutlery and kitchen utensils are included.

The consumers' unions are particularly popular with the working classes, though by no means confined to them. Since to become a member only involves the payment of the initiation fee, which is small, most of the families living in the neighborhood where there is a consumers' union store

will become members of it. As there are many branches, a move only means the transfer from one branch to another of the same general union, without paying a new initiation fee.

It is customary, early in December, for the consumers' unions to declare a rebate or dividend out of the profits of the year, and this is the measure of the efficiency of the organization. It is given at that time in order that the members may have money to utilize for Christmas purchases. The distribution is in accordance with the volume of purchases of the individual members. Track is kept of this in the method of making purchases, and each member is provided with a small book which is taken to the store whenever a purchase is made. The salesman marks the amount of the purchase in the book and this forms the record on which, at the end of the year, the amount of the customer's rebate is figured. The larger his purchases, the larger will be the amount of his rebate, although the rate of it will be the same as the rate of a smaller consumer.

During the year, should the consumer move to another part of the country, the same purchasing book may still be used. Members are also privileged, when there are different stores in the same city, to purchase at will from any of them with the same book. As the clientele of each store varies with its location, some having goods of a higher quality than others, considerable advantage may be taken of these differences.

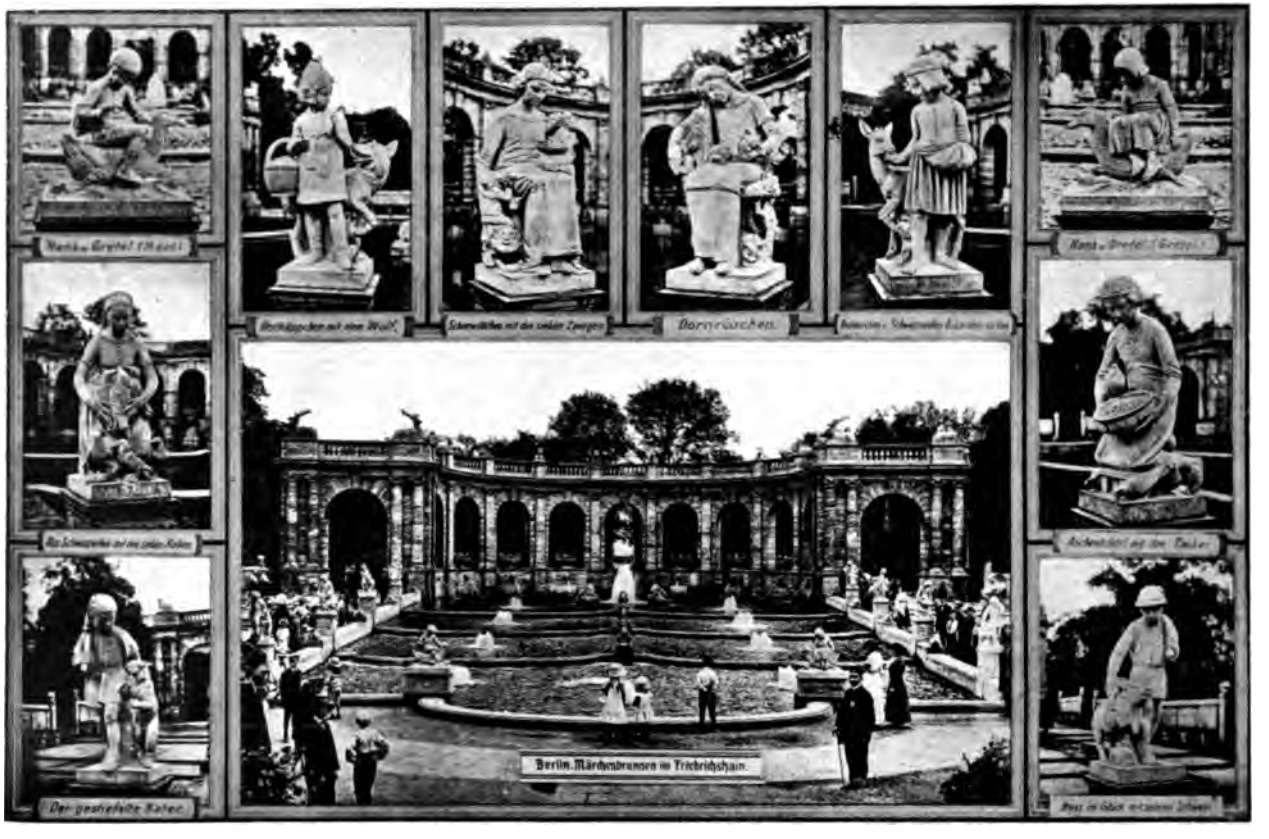
As the local unions work in conjunction with the credit unions, the consumers may in this way obtain a certain amount of credit.

Directly related to the question of municipal markets is that of municipal slaughter houses. Such plants should be provided by every city, whatever its size, and dressed meat should only in exceptional instances be drawn from outside sources.

Such a system would insure cheaper and better meats, while the concentration of the meat business of the country in a single city, with domination of the situation by a trust

CHILDREN'S SCHOOL GARDENS, LOCK HAVEN, PA.

CHILDREN'S SIDE OF THE FAIRGROUND SWIMMING POOL, ST. LOUIS



CHILDREN'S FAIRY FOUNTAIN AT FRIEDRICHSHAIN, BERLIN

Among the statues are "Red Riding Hood," "The Seven Ravens," "Puss in Boots," "Hansel and Gretel" and "Lucky Hans"

shipping great quantities of meat to foreign countries, causing an artificial shortage and consequently higher prices to home consumers, would be prevented.

Under such an arrangement meat would be fresher when purchased and of better quality, since a more complete and comprehensive system of inspection could be carried out.

In the municipal slaughter houses of Germany, the butchers of a city purchase their animals on the hoof, and they themselves use the facilities of the plant for the operations of slaughtering, after which the dressed meat is inspected and stamped with the date. Inspectors later visit the shops and require such meat to be disposed of within a reasonable time. This insures freshness of the customers' supply.

Objection may be made to the presence of slaughter houses in cities, owing to possible nuisance, but modern engineering has made the process of slaughtering such that no exception can be taken to the presence of such establishments.

Connected with the question of municipal slaughter houses is that of municipal ice plants. The problem is one that is of especial interest in the United States where such a liberal use is made of ice. By very small additions, the machinery of the slaughter house may be made to serve for the manufacture of ice, a certain quantity of which is needed for the use of the slaughter house.

A still more economical arrangement is that in which the municipal electric plant, ice plant and slaughter house are operated in conjunction.

Exhaust steam from the steam engine may be utilized for the manufacture of ice in summer and for central heating purposes in winter. The combined plants will thus supply light, heat and power for the city, ice and slaughtering facilities, and in addition the pumping of city water, in a most economical manner, since the full capacity of the machinery can be utilized during the whole of the twenty-four hours of the day, being used for the various purposes at different hours.

While many municipalities have provided public baths,

they have seldom been provided in sufficient number or with proper equipment.

Such baths should be on a large scale and be what may be termed aquatic gymnasiums. There should be a large swimming pool some 100 feet or more in length and 40 to 50 feet wide, varying from 3 to 15 feet in depth at different parts, with spring boards for diving and artificial waves.

Steam rooms, sweating rooms and shower baths should be provided, with both hot and cold water. The showers should be arranged to jet either from above, from the wall at the side or from the floor upwards, the latter form being particularly useful, as it saves the annoyance of wetting the hair. Such showers are operated by the user, who regulates the force, volume and temperature of the water.

The gymnasium should include the various forms of gymnastic apparatus, and it is desirable also to have a running track, which may be arranged around the dressing rooms or around the sides of the swimming pool.

In construction the bath should be throughout of tile and of such other materials as will betray the presence of dirt, in order that the most scrupulous cleanliness may be observed.

A heating plant must be provided for keeping the water heated to the proper temperature, and also for keeping the rooms at a uniform temperature. Arrangements should be such that the pool may be drained and refilled in a short time. Such baths should be in charge of a skilled swimming master, for the instruction of those who wish to learn to swim. Attendants should be at hand to massage those who desire such service.

It is advisable to supply the baths with as many features as possible, in order that they may be utilized to the fullest extent. The price of admission should be low, just sufficient to cover the cost of operation, provided it is not free, while fees for special service, as for swimming lessons and massage, should be turned into the general fund.

Separate municipal baths should be provided for women, but if this is not feasible, certain days of the week should be set apart for their exclusive use.

The City of New York maintains and operates under the jurisdiction of the President of the Borough of Manhattan, twelve Free Public Interior Baths and eleven Free Floating Baths.

For the use of these institutions, there is no charge whatever, the only requisite being respectable and orderly conduct on the part of the patrons, compliance with the rules, and that the bathers furnish their own towels and soap. This has been the policy almost from the opening of the first public bath, although at the opening of the bath in Rivington Street, the city did undertake to furnish towels and soap at a nominal charge to the bathers. However, it was soon found that the loss of towels was very great; the shower rooms were plastered with waste soap, the floors slippery and the drains choked. Besides a certain percentage of danger from contagion existed unless the towels were laundered under strict surveillance. All these evils were at once remedied by patrons furnishing their own requisites and the scheme of supplying towels and soap was discontinued.

In order to meet the demands of the congested portions of the East Side, it was found necessary to locate the baths where they would be of the greatest benefit to the masses of people, and especially to those who could not afford the luxury of a bath at home. Accordingly, one may find them scattered along the thickly populated sections of the East Side from the corner of Cherry and Olive streets to East One Hundred and Ninth street. These baths, along with the floating baths stationed at intervals along the water front, bathe upwards of five millions of people annually, and yet their patronage does not begin to tax their capacity.

During the summer months, from the first of April until the first of November, the interior baths are open daily to the public from 6 o'clock in the morning until 10 o'clock at night. On Sundays during the summer months, they are open from 6 o'clock in the morning until 1 o'clock in the afternoon.

During the winter months, the baths are open from 7 o'clock in the morning until 9 o'clock at night. On Sun-

days they are open from 7 o'clock in the morning until 2 clock in the afternoon.

At the East Twenty-Third Street Bath, the pool is 66 feet long and 25 feet wide. At the shallow end it is 3 feet deep and slopes gradually toward the deep end where the depth is 7 feet. When full, this pool holds about 70,000 gallons of water. Adjoining the pool are shower rooms, where the bather may prepare for the plunge. The West Sixtieth Street pool is 60 feet long and 35 feet wide and contains about 85,000 gallons of water. The water used in these pools is thoroughly filtered before entering the tank and is changed at least three times a week. It is fresh water from the Croton Reservoir and the temperature is regulated, being kept at between 70 and 75 degrees.

The United States Volunteer Life Saving Corps and the Women's National Life Saving League have swimming instructors at the pool during certain hours to teach swimming. These hours vary from time to time. Aside from these instructions, an attendant who is a competent swimmer is required to be on duty constantly at the pool, with instructions to pay attention to all swimmers. It is planned, also, to have regular departmental swimming instructors stationed at the baths to give free instructions throughout the day.

During the year 1911, there were 5,400,567 free baths given by the city of New York in both floating and permanent baths. The average cost per bather during that year was a little over 4 cents. During the summer months of 1911, the bathing at the Rivington Street Bath often reached as high as 3,000 in one day.

During the month of December, 1911, each bather used on an average 9.9 cubic feet of water and required the consumption of 8.8 pounds of coal.

The floating baths are all built about on the same plan, as follows: They are 95 feet long and 60 feet wide, and are floated on eight pontoons, placed four on each side of the bath. In the center there is a large well, divided into two parts, one 93 feet long and 34 feet wide for adults, and one

70 feet long and 8 feet wide for children. The depth of the water in the large well is 4½ feet and in the small one 2½ feet. There are 68 dressing rooms opening upon a small gangway around the edge of the well.

The floating baths, like the interior baths, are free, but of course are used only during the summer. They are open usually from 5 o'clock in the morning to 9 o'clock in the evening and on Sundays until noon.

The interior bath buildings are well-designed buildings of a monumental character, and four of them have gymnasiums in connection with the bathing facilities. The first, the Rivington Street Bath, was opened in 1901, and the city is contemplating further extensions of the system.

Cities which are not near a body of water suitable for bathing purposes may well follow the example of Remscheid, Germany, which established an artificial strand bath.

Remsheid, with a population of 78,000, is situated 8 miles south of Barmen-Elberfeld, directly on top of one of the highest hills of the "Bergische Land" (mountain land), and is distant from lakes or rivers of sufficient size to offer natural advantages for open-air bathing, and it was decided to build a "strand bath" in the valley just below the pumping station of the reservoir, where advantage could be taken of the reservoir overflow. Excavations were made and three basins built of reinforced concrete. The principal basin, for both sexes, has an area of 32,292 square feet and a depth of 4 feet, except at one end, where a part reserved for expert swimmers has a depth of 10 feet. At either end of the main basin is a basin for men and one for women, each 5,382 square feet in area. On one side of the larger basin there is a space arranged for spectators, who pay a small admission fee; on the other, where the concrete slopes gradually to the center, is an artificial sand beach, fitted with gymnastic apparatus. The cost of building was $14,280. The bath was opened to the public on June 29, 1912.

During the first season there were 116,960 visitors, and the total receipts amounted to $6,963.09. During the season of 1913 the attendance averaged over 2,000 bathers daily,

not only from Remsheid but from the surrounding cities of Lennep, Solingen, Ohligs, Elberfeld, and Barmen. Three similar baths are projected in Barmen and Elberfeld which should be ready for use in the spring of 1914.

One of the greatest problems confronting the American public to-day is that of keeping the small manufacturer from being crushed by his larger rivals. The concentration of capital has proceeded to such an extent that the small manufacturer is being eliminated and transformed into the employee of the large concern or driven to running a small repair shop.

The result is that manufacture is concentrated at certain centers and other cities are left with little impetus to growth. It is thus the duty of the municipality to exercise every effort to overcome the tendencies of consolidation. This can only be done by meeting concentration of capital by masses of capital of equal strength, and by adding factors which will overcome the trusts on their own ground.

The following plan is suggested as a possible or partial solution of the problem, and though it has never been attempted in practice, and may be of only theoretical interest; in certain aspects it embodies principles which should prove readily applicable and which call into action a very powerful factor, the initiative of workmen and small employers, in a manner which should serve to meet the competition of trusts effectively.

The proposed plan is as follows:

The municipality should erect a large manufacturing plant, and rent space to small manufacturers in proportion to their needs. It should also equip the plant with all the various kinds of machinery necessary for the manufacture of the several lines of products proposed to be turned out by the participating manufacturers.

The municipality, through a board of managers consisting of city officials, representatives of local banking interests and representatives of the participating manufacturers, should conduct the plant.

This board of managers should arrange for all the pur-

chases of materials needed by the manufacturers, as in this way the credit of the city and the endorsement of the bankers interested would give the enterprises the advantages of the most favorable credits and discounts.

The interests of the bankers would lie in furnishing the capital for the undertaking, through their purchase of the city's bonds issued to erect and equip the factory, and their loans for the use of the manufacturers. The availability of an ample supply of working capital is absolutely essential to the success of such an undertaking, since the small manufacturer requires capital to invest in materials and for wages and other expenses, between the time the order is received and the time the purchaser makes the final payment, often many weeks after the delivery of the finished product. The furnishing, thus, of an ample supply of working capital at reasonable rates, would enable the manufacturers to get their products manufactured without the delay of waiting for customers' payments to get money for materials and labor. The activity of the manufacturers would thus not be hampered by financial considerations and they would by this method be on an equal financial footing with even the largest of the industrial trusts.

The communal manufacturers would each rent a certain space in the equipped plant, with the machinery necessary for the manufacture of his own goods. The raw materials needed by the various members would, as has been noted, be purchased through the central office, thus gaining the advantage for each member of the wholesale prices commanded by the bulk purchases of all the members.

The association would also assist in selling the products, and would maintain its own credit department for ascertaining the reliability of customers. A central bookkeeping and correspondence department would be maintained, saving the individual members the expenses of separate office organizations. Shipments of goods would be made by the shipping departments of the plant and a system of local delivery established. The individual members would thus be saved the expenses of a separate delivery system.

The labor supply of the communal plant could be so arranged as to be shifted from member to member as occasion demanded, thus giving the workers more continuous employment.

The plant would supply to the members light, heat and power at cost price, having its own generating plant, and thus the first cost and depreciation of a number of separate power plants would be saved.

All the activities of the association would be carried out for the benefit of the members so that no profit would accrue to the association as such. Thus all the services performed for the members would be at cost, and on a wholesale basis, and the manufacturing and overhead expenses would be as low as it would be possible for them to be made under any circumstances.

Such a group of communal manufacturers could with advantage be the manufacturers of different portions of a mechanism, such as an automobile. Each could manufacture some special part, as engine, body, chassis, wheels, tires, magneto, spark plugs, radiator, lamps, etc., the whole car being assembled and sold by the association. The surplus manufacture of parts could be marketed elsewhere.

As the association would maintain a system of inspection and would have a trade-mark of its own in addition to the individual trade-mark of the manufacturers, the products of the association would establish a reputation for themselves and be able to meet any competition on the open market. They would, in fact, have a large sentimental attraction, for the public prefers if possible to patronize the independent manufacturer where the trust is met on equal terms.

A communal industry of such a character would be as if a large industrial plant were conducted along the lines of a department store, with each department belonging to the individual manager. It can be readily seen if such were the case in an industrial plant, that there would be a great improvement in the efficiency of the plant, as the individual managers would exert a far different degree of authority and energy than factory foremen.

VIEW SHOWING PART OF THE MUNICIPAL ABATTOIR AND SLAUGHTER-HOUSE AT DRESDEN

The most complete system of its kind; a "spotless town" covering ninety acres and includes 60 buildings, costing $4,260,000

BUSH TERMINAL, BROOKLYN, N. Y.
Docks and manufacturing buildings. A step toward communal industry

Thus a communal industry in which the large trusts are met on an equal footing as to capital, cost of material, labor and selling, should not only not have any difficulty in meeting the competition of the trusts, but should be able to overcome them, owing to the possession of the great advantages of individual initiative. The employee of the large plant can never hope to be anything more than an employee, at most becoming a foreman or superintendent. There is thus, throughout the personnel, a lack of interest, if not antagonism to the work of the establishment. This is the result of the deprivation of the hope of advancement. In the communal plant, however, where the step from employee to employer is so short, through the supplying of capital and machinery by the association, every workman would have the opportunity of rising to a place of independence and, once established, to that of competence. The result would be that a spirit of energy and goodwill would pervade the establishment which would increase the quality and volume of its output and make it a factor in the industrial life of the city, not to be overcome. Numerous other advantages would accrue under such a system which cannot be detailed here, but enough has been said to indicate the great possibilities of the plan.

In the Bush Terminal System in New York are to be found, to a limited extent, certain of the features of such a system, that is buildings adapted to manufacture and commercial purposes in which light, heat and power are supplied, and also facilities for shipment without the necessity of trucking. This system has proved such a great success that it is proposed to have the city buy it and extend it much more widely.

The co-operation of the city and of its commercial bodies and banking interests in the establishment of such communal industries as have been discussed, cannot fail to promote the welfare and prosperity of the city, and assist it in retaining and building up its industries in competition with those of larger cities.

CHAPTER XVIII

CITY CONSTRUCTION AND MAINTENANCE

(A) Street Construction
(B) Sewage Disposal
(C) Care of Streets
(D) Street Cleaning
(E) Refuse Disposal
(F) Water Supply
(G) Gas Supply
(H) Electricity Supply
(I) Electric Street Railways

(A) Street Construction

Street Paving; Street Repairing; Municipal Paving Plants; Double Decked Streets; Pipe Galleries

If a city is to make any æsthetic progress, there must be as a foundation, a sound structural basis. The city itself, aside from a comparatively few public buildings, is principally occupied with the building of streets, of which it must construct and maintain a large mileage.

This work, instead of being a matter of detail as it is ordinarily regarded, is one of the first importance, affecting every citizen in the most direct and immediate manner.

Without streets a city is an impossibility. Imagine the condition if Broadway in New York or Pennsylvania Avenue in Washington had been left in the condition of country roads. The abutting buildings would have been uninhabitable. The proper construction of streets is a fundamental and basic civic activity, and one to which the greatest engineering skill and experience should be given.

An arterial street in a completed condition is made up of numerous and important elements, including the paving, sidewalks, sewer system, gas and water mains, conduits for electric light, power, telephone, fire and police alarm wires,

pneumatic tubes, street car tracks, and possibly elevated or subway structures and contributory equipment.

Of the many forms of street paving, such as asphalt, stone blocks, wooden blocks, bricks, bitulithic and cobblestone and macadam surfacing, there is none which is suitable for universal use. Numerous considerations enter into the question of proper surfacing of every street. The volume and character of the traffic, grade, and nature of the abutting property are among the principal items. The first cost of the street should not be the most important consideration, as the cost of street maintenance plays a much more important rôle, so that in the long run a well-constructed roadway, whatever the initial expense, will prove the best investment if it is suited to the traffic.

The prevalent expensive, yet inferior American street paving is largely the result of political causes, such as the frequent changes of administration, the fraudulent letting of contracts, the monopoly of street construction by interested parties and the jobbery in repairs.

Where civil service rules are in force, a large part of the engineering staff of a city is frequently lacking in the qualities necessary to secure the best results, for though capable of passing the examinations, they have not the personal initiative and progressiveness required of those who hold similar positions in private companies.

Much money is wasted in experimental work by incoming administrations, and before the incumbents have become experienced, a new election brings in a new staff, who are only too eager to blame bad street construction on their predecessors while they themselves are as yet only beginning to experiment. The process is constantly repeated with the worst possible results to the city, and will so continue until competent engineers are attached permanently to the city administration in a direct or advisory capacity.

The various materials used for street surfacing may be broadly divided into two classes.

The first class are those which are prepared in the form of blocks and shipped to the point of construction and the

second class include surfacing prepared and laid at the point of construction. Of the first class granite blocks, sandstone blocks, wooden blocks, vitrified brick, composition block and cobblestones are the principal forms, while in the second class are asphalt, bitulithic, concrete, macadam and similar materials.

Asphalt as a street surfacing has numerous advantages though at the same time certain disadvantages. It is one of the most nearly noiseless of street materials and produces a certain æsthetic effect, its smoothness and homogeneous appearance giving a finish and an urban character to a street which is not surpassed by any other material.

It is a somewhat expensive street material and repairs require special apparatus and experience. On grades, its slipperiness in wet weather is against it and in hot weather it becomes somewhat soft. As certain of its components are liable to evaporation, it rots out under light traffic before it wears out. In small cities, owing to this fact and to the cost of repairs, it is a more expensive form of paving than in large cities.

In cities having or contemplating a large mileage in asphalt streets, the erection of a municipal asphalt plant for both the laying and repairing of streets, greatly reduces the cost of this form of surfacing.

New York City is now erecting a municipal asphalt plant designed by the writer, which has a capacity of 3,000 square yards of 2-inch topping per eight-hour day. The plant is located in the block between 90th and 91st Streets, Avenue A and the East River, which in its greatest dimensions is 200 feet by 540 feet.

The plant proper will consist of three 15-ton driers so arranged that either binder stone or sand may pass through all three or part of them. Under ordinary circumstances, two driers are used for topping and one for binder.

There are three tar melting kettles and two 150 horse-power boilers. Part of the steam will be used for melting the tar and part for the 150 horse-power steam engine which operates the machinery.

There is also a 75 horse-power engine and provision is made to install one more kettle, one more drier and one more boiler, all of the same capacity as the units now in place.

The operation of the entire plant, from the unloading of the barges to feeding the driers, kettles, etc., is done automatically, and manual labor is cut down to the minimum. Provision is also made for the installation of a rejuvenating plant with apparatus for re-using the old asphalt which would otherwise be wasted.

When completed this plant will be one of the largest and best equipped plants in the country.

From a financial standpoint, one of the great savings will be due to the promptness with which repairs can be made. Under existing conditions, so much time elapses between the report of a break in the pavement and the repairs, that the damaged area increases greatly. It is a self-evident fact that continuous maintenance will be much more economical than intermittent repairing.

The work done will be of a higher quality, since by using only the best grades of materials, the city's interest will be fully protected.

Another important gain will be that of properly adjusting the supply of work to the capacity of the plant, so that operation will be practically continuous.

Much more advantageous contracts may be made, also with private companies, when they are obliged to meet the competition of a municipal plant.

The advantages, indeed, of municipal owned asphalt plants are so great that they will undoubtedly be adopted by most of the larger cities within a short time.

A form of surfacing known as bitulithic, claimed to have advantages over asphalt, is being used to some extent, but it has not yet been in use long enough to determine its status.

Granite block paving is suited only to the heaviest traffic, being extremely noisy and wearing on vehicles. It is adapted for heavy trucking as it gives horses a good foothold, but it is out of place where lighter vehicles are called

upon to make any speed. For use around docks, freight terminals and in warehouses districts, it is very serviceable.

On the continent, stone block streets are sometimes laid with wooden strips or laths one-quarter inch thick, between rows of the blocks, which are larger than those usually employed in the United States. The blocks are laid on concrete foundations, with, in some cases, a thin layer of sand as a cushion between the blocks and the concrete.

A street found in some cities abroad is called the mosaic. The stones are cut to a uniform depth, but are of different shapes and are laid radially on a sand cushion, with different kinds of fillers. The results are somewhat ornamental and prove very satisfactory.

Brick is a comparatively low-priced paving in first cost, but it is noisy, not easily cleaned and wears out quickly under heavy traffic.

Creosoted wood block paving is used to a large extent and it is the nearest rival of asphalt. It is higher in first cost but more easily repaired and of longer life under light traffic. It needs, however, a concrete foundation and any breaks must be immediately repaired. It is more slippery under some conditions and less so under others, and at times has a certain odor.

For streets in outlying districts and in small towns, macadam or crushed stone is one of the best and cheapest forms of paving if properly constructed and kept in repair. As only the pressure and moisture serve to bind the particles together, it wears much more rapidly than paving in which the particles are firmly bonded together as with asphalt, and consequently it produces clouds of dust unless kept clean and well flushed.

Some success has attended the plan of impregnating macadam streets with coal-tar preparations, the tar permeating a thin layer of the surface of the street and serving as a binder, producing almost the effect of an asphalt street. Such treatment must be applied with great care and renewed annually or oftener. It makes a street much superior to the untreated macadam. In 134 English cities, treatment of

TERRACE, STAIRWAYS AND FOUNTAIN, CENTRAL PARK, NEW YORK CITY

GATEWAY, SANSSOUCI, POTSDAM
A splendid example of a park entrance

SICILIAN GARDEN, SANSSOUCI, POTSDAM

this character lasted on the average in half the cases from six to nine months and a year for the remainder. The second treatment is often only required in the center of the road.

The cost of such treatment was 2 to 2½ cents a square yard when machine spread and 2½ to 3 cents a square yard when hand spread. The average consumption of tar was from 3 to 5 gallons per square yard in 99 cases and 5 to 7 gallons and over, in the remainder. Sand, granite chippings, gravel dust, cinder dust, etc., were used as a surfacing, with some preference expressed for small granite chippings (¼ inch). The cost of tar was from 2 to 8 cents a gallon and averaged 4 to 5 cents a gallon.

The treatment of streets and roads with heavy petroleum crude oils also has the effect of a binder and settles the dust question, although being dirty in appearance and frequently ill of odor it often proves a nuisance. Some oils also cause the loss of eyebrows.

Tar, it is also asserted, causes eye trouble, but tests on the eyes of rabbits and dogs have not borne this out. It is also claimed that the acridene fumes from hot tar cause epitheliomatous cancer, while corneal ulcer has been caused by exceedingly fine pitch dust. While doubtless acridene is irritating to the skin and mucous membrane, a reasonable degree of care on the part of workmen will prevent injury when tar preparations are being put down.

Asphalt, granite blocks and wood blocks are the leading forms of street surfacing for cities, and though their first cost is high, especially for the smaller cities, they will prove in the long run one of the best investments that a city can make.

In the construction of these standard forms of streets, the greatest care should be taken to see that they are properly built, with foundations capable of carrying the traffic, for the surfacing of the street may be changed or renewed at any time if the foundation has been properly laid, but unless the foundation is good, any form of surfacing will not give service.

Abroad, the greatest care is given to the foundation, it being finished smooth and true to template without the slightest irregularity. Often a light surfacing of mortar is added, after the manner of concrete sidewalk, so that when it comes to putting down the asphalt or other paving, no allowances have to be made for imperfect foundation.

In the laying of asphalt, German cities go very thoroughy into the questions of finish and repairs. The specifications require that the top of the finished surface be entirely smooth and without waves, and that at no place shall the water stand on the surface or in the gutter. For three years after completion, the contractor must maintain the street at his own expense. During the succeeding twelve years, the contractor must maintain it for a certain fixed annual payment. He is also paid for re-covering any portion torn up for excavations.

It will thus be seen that the cost of maintenance of the street for a period of fifteen years under ordinary usage, is known within reasonable limits before the work is begun. As the contractors are thus interested in the maintenance of the street, they repair breaks at the earliest possible moment, saving themselves expense by prompt action.

American streets usually present the poor appearance they do on account of neglect. Small holes increase quickly in size, traffic is disturbed and the cost of repairs becomes much greater, and being paid on a per yard basis in many cases, the larger the holes the more there is in it for the contractors.

One source of injury to street surfacing not permitted abroad is that of bonfires, which injure the asphalt and wood block streets particularly, and such injury if not looked after at once means a large repair bill later. The Borough of Manhattan in 1910 spent $12,000 repairing damage caused by bonfires. If this could be assessed against the celebrants, less enthusiasm in this direction would probably be manifested.

A street, in addition to the traffic which passes over its surface, serves other highly important functions, carrying

various subsurface utilities which are necessary to the existence of the city. Among such utilities are gas and water mains, sewers, electric light and power cables, telephone, police and fire alarm signal wires, pneumatic mail tubes and often subways and subsurface vehicular traffic tubes.

The accompanying diagram, Fig. 64, is of a street which for purposes of description may be termed a "Metropolitan

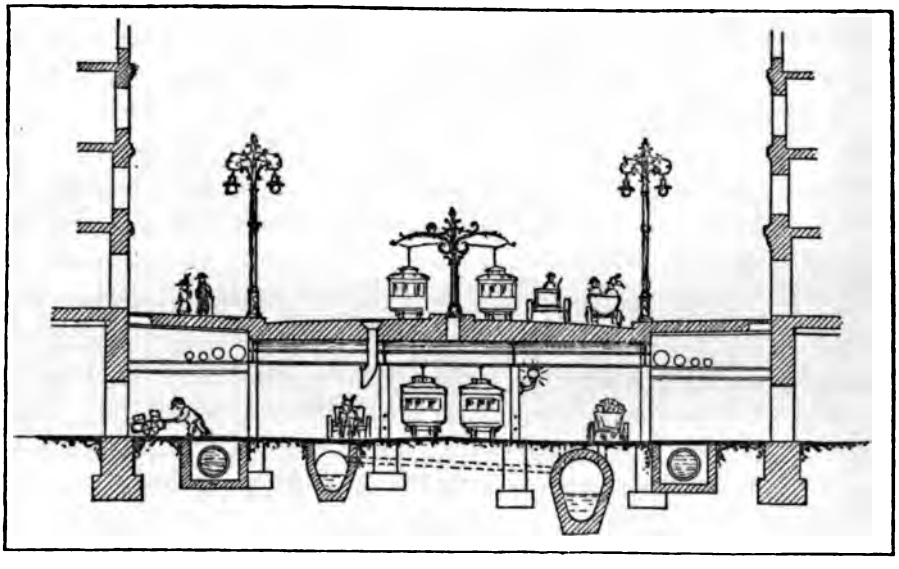


FIG. 64. CROSS SECTION OF A DOUBLE-DECKED STREET SUITABLE FOR METROPOLITAN BUSINESS DISTRICTS

Street." It shows, arranged in the most advantageous manner, such utilities, and it is a form suitable to a comparatively narrow thoroughfare, 100 feet or so wide, which cannot be widened and which must accommodate a heavy volume of traffic.

The street is double decked, with a surface and a subsurface level, the surface level being used for pedestrians, light vehicular traffic and street cars, and the subsurface level for express trains, heavy traffic and auxiliary purposes. The entire lower level is clear, except for the supporting columns, while the express trains are protected by a railing.

Through the center of the street on the surface is run

a safety isle between the street car tracks, continuous except at the intersection of cross streets. This safety isle is penetrated by a continuous slot, heavily grated, which serves as a ventilator for the subsurface level, while additional ventilators are in the sidewalk adjoining the building line. Along the safety isle are also the trolley wire poles, which are of an ornamental character to correspond with the street lighting poles along the sidewalks. The underground trolley wire system could be used instead of the overhead, but the latter is more reliable and satisfactory in operation and enables the cars to run over suburban lines without loss of time in lowering trolley and shoe.

Under the vehicle ways of the subsurface level are two sewers, the smaller one for rain water and the larger for heavy sewage. This separation is advisable for a number of reasons. An overflow conduit leads from the rain-water sewer to the other, to take care of the surplus water in case of storms.

A narrow-gauge track may be laid over the sewers, to be used for hauling freight and for the refuse carts. The latter are for the purpose of removing the rubbish and waste of the street above, which is swept into pits or chutes in the street, arranged with a cover at the top and a gate at the bottom, enabling the contents to be dropped directly into the rubbish carts. Removable openings into the sewer are placed directly under such chutes, so that in winter, snow may be shovelled or dumped directly into either sewer, and the street thus be quickly cleared.

The heavy traffic vehicles unload directly into the basements of the buildings and ashes and garbage are removed directly to the rubbish carts, without ever getting into the street above. This cuts down street cleaning to a minimum, and leaves the whole street for traffic.

Pipe galleries are provided under the sidewalks on each side for gas mains, heating pipes, electric light and power cables, fire alarm, police alarm and telephone wires and pneumatic mail tubes, which are thus always readily accessible. The water mains, owing to their great weight, are

not carried in the pipe gallery, but in a trench under the subsurface level, having a removable cover, one main on each side to obviate the necessity of pipes crossing.

The accompanying diagram, Fig. 65, shows a similar form of "Metropolitan Street" adapted for the purpose of a thickly populated residential street. The width of the street is taken at 120 feet, although it may be more, indeed up to any width desired.

A four-track subway is provided on the subsurface level,

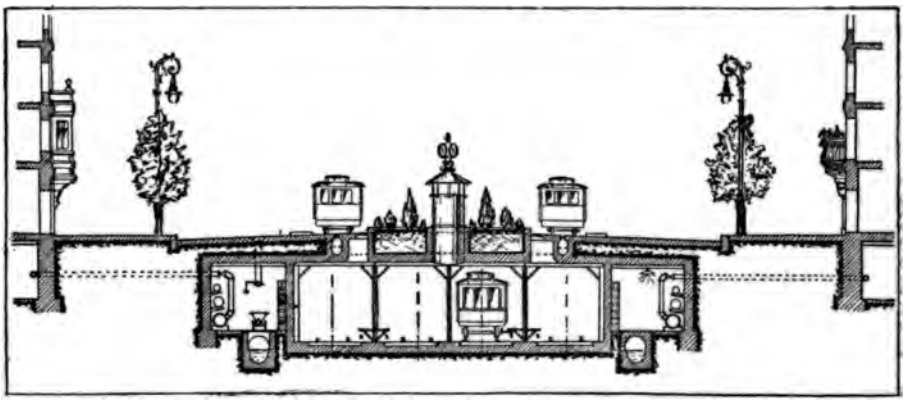


FIG. 65. CROSS SECTION OF METROPOLITAN RESIDENTIAL STREET WITH EXPRESS AND LOCAL SUBWAY RAILWAYS, GENERAL UTILITY SERVICE TUNNELS AND STREET RAILWAYS ON BOTH SIDES OF A FLORAL AREA

the middle tracks for express trains and the outer tracks for local service.

This subway is shown similar to some sections of the New York subway, with, however, numerous improvements, based upon the writer's experience with that undertaking, he having been for four years, during its design and construction, connected with its engineering staff, and upon the result of foreign experience.

The width of the New York subway, 12½ feet between centers of columns, is insufficient, as 13½ to 14 feet should be allowed. The circulation of air is very poor, forcing the adoption of artificial ventilators, which have not proven satisfactory.

In order to produce an adequate circulation of air, it is necessary to run the trains through individual tunnels, each train thus acting as a plunger, forcing air out ahead and drawing it in behind. This division into separate tunnels is best accomplished by means of a partition between the tracks as indicated by the diagram.

The tracks are shown placed slightly off center, in order to make room for a walk at the side. This walk is for the use of passengers in cases of accident, and for the use of the trackwalkers. It is also a protection against the third rail which it serves to cover.

Air gains ingress and egress at the stations and through ventilators placed in the middle of the street over the express tracks. These ventilating columns are of an ornamental character and of ample capacity, and should be placed at least one every block. Every fourth or fifth column should be crowned with a four-dial illuminating clock, and the intermediate ones with electric globes. The local tracks are ventilated at intervals by the grated openings at the side of the central grass plot.

The arrangement of the remainder of the underground portion of the street is somewhat similar to that previously shown. A general service tunnel is placed on each side, with sewers and narrow-gauge tracks for the refuse carts, while chutes lead from the street above for dumping refuse and snow. The water mains, gas mains and other piping and cables are carried at the sides of the tunnels.

The surface cars run on either side of the central parkway of the street and low safety isles are provided, adding to the safety and convenience of the passengers and indicating where the cars stop.

The central parkway area is turfed and laid out with small ornamental trees, placed to good advantage and trimmed in accordance with a well-considered design. No railing is required around this park area, as it is sufficiently protected by its curbing. As it extends to the intersecting streets, it forms a series of small, narrow parks along the whole length of the avenue. With the trees along the edge

of the sidewalks, turfed around their bases and the balconies of the buildings decorated with miniature flower gardens, the effect produced by the street would be most attractive and inviting. The lighting poles and column ventilators are an added embellishment, and since the surface is never likely to be torn up, the avenue will remain in an agreeably finished state.

Avenues of such a character are not only highly efficient in their primary purposes, that of being a means of communication and conveyance of materials to and from the houses, but in their æsthetic effect they add distinction to the city and serve to increase the pride and civic enthusiasm of the whole body of citizens.

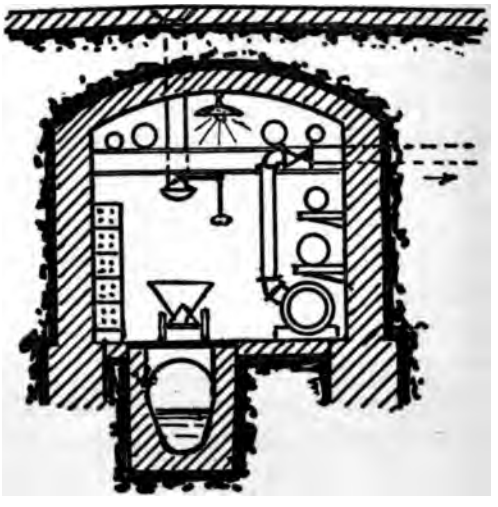


FIG. 66. GENERAL PUBLIC UTILITY TUNNEL FOR WATER AND GAS MAINS, ELECTRIC CABLES, ETC., REFUSE CAR TRACK AND SEWER

In streets in which traffic is not so great as to demand underground facilities, it is highly desirable to have a small general service tunnel, such as is shown in diagram, Fig. 66. A single sewer and refuse cart tracks, with chutes, will suffice for the refuse and snow to be removed. The principle use of such a tunnel, however, is to carry the pipes, cables, etc.

(B) SEWAGE DISPOSAL

System of Sewers; Sewage Treatment Plants

OF the indispensable elements in the planning of a city, sewers are among the most important. Baumeister in establishing the theory of city planning gave them an equal value with streets and traffic.

A comprehensive and efficient sewage drainage system

must therefore be the first work of the city planner, and due allowance and provision must be made for increasing such facilities as the city grows in population. It is, indeed, scarcely possible for any one who has not lived through a serious strike of garbage removal employees to understand what the immediate removal of waste material means to a city, and scarcely possible for one who has, to overestimate its importance.

The character and size of the sewage system adopted depends on the location of the city and the natural conditions and methods to be adopted in disposal of the sewage.

The proper disposal of the sewage is one of great consequence, since epidemics are frequently caused by improper disposal, especially in the case of discharge into rivers or lowlands.

It is impossible to lay down any hard and fast rules as to which system of sewage disposal is the best, since a system suitable for one city will not answer the requirements of another. The commerce and industries of a city, the nature of its streets and traffic and other factors make the problem one which requires the most careful consideration and one in the solution of which only the most experienced engineers, acquainted with the progress of the science of waste disposal in the most progressive countries, should be retained.

Sewage disposal is in reality a new science, and great advancement has been made in the last few decades, principally abroad, so that every advantage should be taken of modern developments in the planning of a city's sewer system.

Cities which are located on a large and swift-flowing river may without risk discharge their sewage directly into the stream, if floating débris is prevented from escaping.

The self-purifying power of water is usually underestimated, especially that of rivers. The presence in river water of a certain amount of oxygen, necessary for saturation, will effect the mineralization and gasification of considerable quantities of putrescible substances, by means of biological processes which rapidly develop when such sub-

stances are present. These operations precipitate a sludge on the bottom of the river which is as harmless as silt, while the gases are emitted at the surface. If too large a quantity of sewage, however, is emptied into a river, the odor emitted will make the river banks uninhabitable, while the sludge will accumulate and clog the channel of the river and the process of the self-purification of the water will not be completed before it reaches a lower city and causes contamination at that point.

Depending on the nature of the city's streets and the nature of the sewage to be removed, a single or a double sewage system may be adopted. In the latter form, one sewer is for rain water and the other for strong sewage. The rain-water sewer is for carrying off rain water from the buildings and streets, while the other is for toilets, factory waste, etc.

The former may go directly into the river, while the latter is best disposed of in a sewage treatment plant, of which there are many different types.

In order to prevent the discharge of the street detritus into the rain-water sewers, suitable overflow cesspools should be located at each gutter inlet, for its collection, as in some cases, especially in heavy traffic streets, the detritus is of an even more putrescible nature than the strong sewage.

In some cities, the detritus of the street is allowed to go directly into the sewer and the flushing of the sewer is left to occasional storms. The result is that the sewers are frequently clogged and must often be cleaned.

Before streets are flushed, they should be properly cleaned to prevent the filling up of cesspools and sewers. With well-paved streets, properly kept clean, there will be a minimum of detritus and the sewers will require little attention.

It is undesirable, under any and all circumstances, to discharge into sewers certain waste material, such for example as gasoline in garage districts or acid refuse from factories. Gasoline fumes in sewers often result in dangerous

explosions, throwing the manhole covers into the air, with great damage to property and danger to the public.

Neither should any steam or other vapors be discharged into the sewers. A bad practice much followed is to discharge blow-offs of boilers into the sewers. Such blow-offs should be discharged into blow-off tanks, from which, after the steam is condensed and the pressure released, the water may be discharged into the sewers.

It would not be economical to construct the rain-water sewers of a capacity sufficient to carry the maximum flow, as this is in case of storms often ten times as much as the normal requirements. It is, therefore, necessary to have storm overflows connected with the strong sewers, by means of which rainfall may be temporarily taken care of.

As sewage treatment plants are constructed to accommodate several times the normal capacity, it is only in the case of bad storms that the strong sewer will carry a greater volume than can be accommodated by the plant, but when such a condition arises, the surplus over the capacity of the plant must be discharged into the river, and while this surplus will contain a certain amount of strong sewage, it will only continue for a short time, and will be so diluted as to usually produce no ill effects.

The respective advantages of the single and double system of sewers are numerous, but local conditions must always finally be the determining factor in the adoption of the one system or the other.

In the disposal of strong sewage, several systems of treatment are employed, among them being sewage farms, septic tanks, mechanical screening and sedimentation, the lignite method, trickling filters, biological filters, land irrigation and sprinkler systems.

Some of the systems are only partial treatments and combinations are needed to effect the complete treatment.

In the sewage farms and land irrigation systems, large tracts of land are required, and as the city grows, these tracts may become so valuable as to cause the more compact biological works to be substituted.

The principal object of sewage purification is to dispose of the sewage in the most unobjectionable manner possible. In so doing, however, valuable by-products are produced, principally fertilizer. Whiskey has also been produced both in Germany and in this country as such a by-product, in an experimental way, but it has not been found salable, although of good intrinsic quality, in either country, and the production here will undoubtedly remain in the stage of a successful experiment, similar to the experiments in Germany which did not survive the initial stage and came to an end many years ago.

German chemical science has reached such a state of perfection, however, that it is feasible to reconvert toilet sewage into absolutely pure drinking water in a very short time, though such a conversion is never likely to be of any extended practical use. It indicates, however, the entire practicability of sewage purification.

(C) Care of Streets

How to Preserve Street Surfaces; Street Sanding; Street Flushing

After laying an expensive asphalt or wood block street, city authorities in American cities seem to feel that their whole duty has been performed. The street is immediately left to the mercy of traffic and the elements and nothing more is done until some serious repairs become necessary.

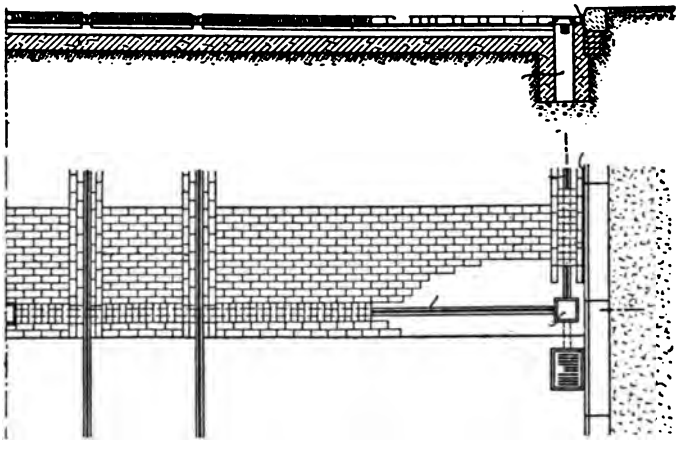
A very different process is followed in European cities, which consists in protecting the street and in facilitating traffic, so that much greater service is gotten out of a street than is the case in America.

The principal expedient adopted is to sprinkle or cover the street lightly with various substances whenever weather conditions or other reasons require it.

Sand is much used for the purpose, and is scattered over the streets in a number of ways. Sometimes a man with a trowel-like tool, carrying a bag of sand suspended from his neck, sows the street with the sand after the manner of a

farmer sowing grain broadcast. Other methods of distributing the sand are by means of small box-like carts and shovels, one man pushing the cart and another sowing the sand. The cart is often the same one used for collecting refuse.

The sand sower gains considerable skill and works with such rapidity that the cost of the work is insignificant in comparison with the benefits derived. A skillful man can cover from 80,000 to 100,000 square feet an hour, or half a



FIGS. 67 AND 68. METHOD OF SUB-SURFACE DRAINING OF WOODEN BLOCK STREET PAVING IN BERLIN

One of the many unseen features which contribute to the appearance and ease of upkeep of Berlin's streets

mile of ordinary street. The sprinkling of the sidewalks may be left to the householders.

The method with shovels and cart is not so expeditious, since the sand in such cases is spread more thickly. There are also automatic sand-sowing machines of different types, which are more rapid.

Among other materials used are a coarse sand or very fine gravel, and fine stone particles. All such materials should be dry and perfectly clean and free from dirt or impurities which would prevent free scattering or subsequently cause dust. Ashes are only used in case of an emergency.

The material for street sowing is kept in boxes, holding from one to three cubic yards, in convenient locations, being thus at hand whenever needed for use.

Applications are made when the streets are covered with ice, sleet or frozen snow, in the case of cold, drizzling rains, or during precipitation caused by fog or after heavy rains when the weather conditions are such that the streets will not readily dry. A twofold object is attained by such sowing; the slipperiness of the street is overcome, and safety for vehicles and pedestrians assured, and the surplus

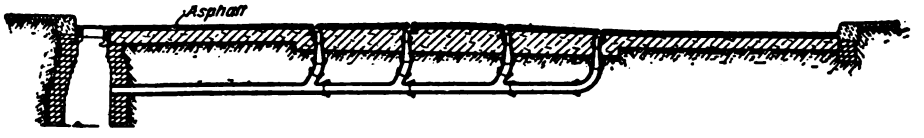


FIG. 69. METHOD OF DRAINING RAILS OF STREET RAILWAY SYSTEM, BERLIN

In order to protect the Asphalt Paving from decay. Another of the many unseen features of construction which have contributed greatly to the appearance, cleanliness and ease of upkeep of Berlin streets

water is absorbed by the sand so that it does not lie and rot the surfacing.

Thus the greatest objection to asphalt streets, their slipperiness, is obviated.

As streets are only flushed at times when the water will readily dry off, there is no occasion to sand the streets after flushing.

When bodies of men are to pass over icy streets, the sand or small gravel to be scattered is first moistened with a solution of salt, as it will then the more quickly attack the ice of the street.

Sand in being sown on the streets should be used as sparingly as possible to accomplish the desired result. A very small quantity is found sufficient for a considerable area. From 2 to 10 liters suffice for 1,000 square meters, which is 1 cubic yard for from 150,000 to 750,000 square feet of surface or from 3,000 to 15,000 feet of 50-foot street.

When the conditions of ice or moisture which made nec-

essary the application of the sand have passed, it should all be removed, as otherwise the streets will become dusty.

In good weather asphalt and wood block streets are treated with an oil emulsion. Applied five or six times during the summer, all the desirable results are accomplished that follow from a daily watering.

Street sweeping in winter, a difficult work, owing to the cold dust stirred up, is accomplished in an efficacious manner by first sprinkling the streets with a chloride of calcium solution which lays the dust and so melts the frozen dirt that the street-sweeping machines can accomplish their work.

(D) Street Cleaning

Hours for Street Cleaning; Methods of Street Cleaning; Garbage and Snow Removal

The cleaning of streets, to be properly carried out, should be under the supervision of engineers of experience, as where the work is put in the hands of mere politicians, as a sort of any good fellow's job, the results, as seen in so many American cities, are about what could be expected.

The lack of system, and want of technical training on the part of the officials in charge, makes street cleaning unnecessarily expensive, leaves the streets in a bad condition and causes the cleaning to be carried out in disagreeable and unsanitary ways.

In foreign cities, engineers specialize on this subject. Street cleaning has been reduced to a science, and economy, efficiency and the comfort and convenience of the public is considered at every point.

The purpose of street cleaning is to remove as quickly and as cheaply as possible, all foreign matter in the streets and to thus conduce to the health of the public by minimizing the circulation of germ laden dust.

The cleaning of streets should be carried out in a systematic and thorough manner. The cleaners should proceed in crews with the necessary apparatus, both to clean the streets and the sidewalks as well if necessary, and the lay-

HIGHLY EFFICIENT REFUSE COLLECTING SYSTEMS AS EMPLOYED IN THE PRINCIPAL GERMAN CITIES

Bottom dumping can, lifted from sunken receptacle in sidewalk. Refuse can for street sweepings. Sectional refuse collecting cart with detachable electric automobile-tractor

REFUSE DESTRUCTION PLANT, HAMBURG

The largest in Europe. The electric power generated operates the city water pumping plant

SEWAGE DISPOSAL PLANT, PHILADELPHIA

out of the work should be such that no member of the crew needs to wait on the progress of the other, but all proceed simultaneously, and when they have passed through the street, the work will be done. The method of piecemeal street cleaning, with the householder sweeping the dirt into the street, the street cleaner sweeping it into piles, and the piles being removed by wagons, with the occasional passing first on one side of the street and then on the other of some piece of street cleaning apparatus, results in a continual stirring up of dust, to the great discomfort and inconvenience of all concerned, while the street never really gets cleaned.

The number of men in the cleaning crew depends on the kind of machinery used. As no machine is capable of reaching all parts of the street, a certain amount of manual sweeping is necessary, especially when the sidewalks are cleaned by the municipality. Such manual sweeping should be carried on in conjunction with the machine sweeping, so that, as indicated, the whole width of the street will be cleaned at once.

In order that such cleaning may proceed with efficiency and despatch, and consequently with economy, the streets must be practically clear of traffic, as the presence of vehicles, especially those standing at the curb, greatly delays the work of the crew.

As the operation of such a crew also handicaps traffic, and as the public prefers to see the streets clean, rather than to see them being cleaned, it is essential to select a suitable hour for cleaning. German cities have conducted numerous tests for finding out the most favorable hour. The city of Dresden adopted the practice of cleaning the main streets in the early morning hours, beginning about 4 A.M., and finishing the business sections by 6 A.M, some 20 to 30 per cent of the entire street area. The cleaning of the remainder of the streets proceeds immediately after the main streets are finished, and the whole city is cleaned by 9 A.M. Only streets in outlying districts are cleaned later in the day, often in the afternoon, but all streets

must be cleaned once a day, whether there is much dirt or little on them.

The practice of Dresden has been followed by practically all prominent German cities. Some of those of less importance, owing to conditions of light traffic, continue in old methods, but the larger cities have been forced to adopt the early morning plan. The advantages of the system are that the cleaning can be carried out by daylight and is consequently better performed than when carried out under artificial light, that the workmen are more efficient as day workers than as night workers, and that during the early morning hours traffic is at the minimum.

It is essential that the sidewalks and other adjoining spaces be cleaned before the crews pass through the street, as otherwise the cleaning would not be thorough. Cities should, therefore, clean the sidewalks in business districts, owing to the early visits of the crews, while house owners in the residential districts which are visited from six to nine o'clock by the cleaners are required to have the streets in front of their houses cleaned and ash and refuse carts ready for removal by a scheduled time, under penalty of a fine. No refuse may be placed on the sidewalk, but must be kept on the householders' premises in such places as will not cause annoyance to the neighbors. As the street cleaning crews may be expected at a fixed time daily, the householders are able to make their arrangements accordingly, and thus the whole process is carried out in the most expeditious and convenient manner.

The crews are compelled to work in a manner as unobjectionable as possible, with a minimum of dust raising and noise making.

Conditions of such a kind can only be brought about when the department itself is efficiently administered by capable and technically trained officials, who devote their time and energies to the duties in hand and not to political activity and experimental devices, and when regulations are such that the householders are compelled by law to co-operate with the department.

In the removal of snow, American cities are chronically slow, having an abiding faith in a favorable change of weather. The ever-ready excuse is that not enough men and wagons are obtainable, but in reality the reason is, more frequently, executive incompetency, politics and lack of system.

While the problem is somewhat difficult in America, on account of the heavy falls of snow, our cities are financially well situated to handle the matter, so that failure is only due to lack of proper preparations and absence of systematization.

A highly effective plan for the removal of snow is that of dumping it into sewers, as has been noted. Precautions must be taken not to dump or sweep into the sewers with the snow any matter liable to settle in the sewers and clog them up, such as street detritus, as the subsequent cleaning of the sewers might prove more expensive than the removal of snow by some other method. Nor, in removing snow by sewer dumping, should the amount of snow dumped in at any one time be sufficient to cause the sewer to become clogged up.

Where sewage pumping plants are installed for elevating sewage, snow should not be dumped into the sewer within some 2,000 feet of the pumping station, as otherwise trouble with the pumps is likely to occur.

The swifter the flow of the sewer, the better it is adapted for purposes of snow removal, which is preferably carried on at night when the ordinary flow of the sewer is at its minimum.

Many American cities are fortunately placed in having large volumes of water at their disposal, which may be utilized in flushing snow and slush directly into the sewer, a process which has many advantages, especially when salt water is available for the purpose.

Perhaps the most urgent of the duties of the street-cleaning department is the removal from the streets of the carcases of dead animals, not only on account of the unsightliness of such objects, but also because, especially in summer, they are a menace to health. Singularly enough,

in many American cities, including those constantly exploiting their civic improvement plans, there is a lack of co-operation between the police, to whose notice such matters naturally first fall, and the street cleaning departments, so that the carcases remain, often for days before being removed. It would certainly seem a necessary preliminary to street planning to have the streets free of such impedimenta.

Street-cleaning machinery consists principally of three classes, sprinkling, sweeping and removing apparatus, though there are many forms of combinations of one or more classes in a single piece of apparatus.

The sprinkling apparatus is designed especially for economical use of water, from ¾ to one gallon often sufficing to cover 1,000 square feet of surface, in the best forms of apparatus.

Cleaning apparatus consists of rotary brooms and rotary scrubber and squeegee devices, while vacuum sweepers are also coming into use.

The removing apparatus is usually in combination with a sweeper or scrubber, the dirt being elevated to the cart by mechanical conveyors or suction.

A form of machine much used in German cities is a gasoline or electrically driven automobile, with a water tank and sprinkler, scrubber and squeegee apparatus and a mechanical conveyor or suction device for carrying refuse to the collecting box. Such a machine is complete and effective. It may also be found as a horse-drawn vehicle.

As apparatus of this kind is expensive, some German cities, like Düsseldorf, utilize a form of electrically driven machinery in which the motive part, the motor, storage battery and controls, with chauffeur's seat mounted on the front axle, is a detachable unit, which may be employed in connection successively with various forms of cleaning apparatus, some for summer use and others for winter use.

Electrically driven machinery has proven more economical than horses and it is being substituted as rapidly as the old equipment can be disposed of.

The Street Cleaning Department of Berlin has published the following figures bearing on the relative efficiency of motor and horse washing machines. The figures given represent the cost of operation per 8-hour workday:

Electric-driven machine:	
Driver's wage	$1.25
Electricity consumed (on the average 1.716 kilowatts per hour at 3.808 cents per kilowatt) in eight hours	.52
Insurance of accumulators against deterioration at $130.90 per year, or per day ($130.90 ÷ 300)	.44
Repairs, figured on basis of past experience	.63
Amortization, figured at 15 per cent	1.49
More rapid consumption of rubber rollers owing to higher speed	.08
Total	4.41
Horse-drawn machine:	
Driver's wage	1.12
Two horses, at $1.51 per horse	3.02
Repairs	.19
Amortization, figured at 10 per cent	.24
Total	4.57

Commenting on these figures, the department points out that an electric machine cleans in an hour 6,937 square yards of street surface or in a day of eight hours 55,496 square yards at a cost, as shown, of $4.41, while a horse-drawn machine cleans in the same time only 44,013 square yards at a cost of $4.57.

When streets and sidewalks are cleaned by hand sweeping, there should be provided receptacles of appropriate design and suitable capacity for the reception of the street sweepings awaiting removal. A useful form of such receptacle would be one which could be removed without being emptied, another being left in its place for the next day's sweepings. The same method is equally applicable for smaller garbage cans and household refuse, as has been described. Other receptacles for street refuse may be sunk in pits as also noted. They are made of steel with a dumping bottom, and the removal cart is provided with means

of lifting them out of the pit to the top of the cart, which is covered with a top having special openings, so that the contents of the cans may be dumped into the cart without being scattered by the wind. After being so dumped the cans are lowered again into place in their pits.

In order to avoid handling, such can pits are located in the sidewalk near the curb, and the street refuse is swept directly into them, a small hinged flap bridging the gutter. The pit is, of course, provided with a cover.

As stated, the removal of street sweepings, garbage and refuse should be done in wagons invariably having covers, in order to protect the passing public and the workmen from escaping particles. It is better, however, to have it removed in the original cans, leaving empty cans in place, as this is an absolute protection to all concerned and gets the wagons off the streets sooner.

If wagons are used into which the rubbish is dumped, they should be of the end dumping type, and in some cases it is preferable that the body be detachable so that it may be lifted off by hoisting cranes and dumped at any desired place. This is especially convenient in connection with the work of refuse destruction plants.

(E) Refuse Disposal

Land and Water Dumping; Incineration of Refuse; By-Products of Garbage and Refuse

In the removal and disposition of the waste products of cities, which consist of ashes, garbage, rubbish, street sweepings and the like, several methods are in use, such as dumping on land, dumping in water, plowing into the land, feeding to swine, reduction and incineration, the last two being the most desirable plans.

In choosing a system, a thorough study should be made of conditions, such as the length of haul, convenience, nuisance, etc., and the system should be selected which best suits the circumstances.

Land dumping, while the cheapest and easiest way, is

highly objectionable, particularly if the kitchen garbage is dumped. In any event the dumping ground should be located so that the odors will not become a nuisance, and all combustible matter should at intervals be burned by bonfires. Such dumping grounds should be surrounded by high fences to prevent scattering of light rubbish by the wind. The land once used for such purposes cannot be built upon for years.

In water dumping, the refuse and garbage is dumped into scows at piers, and towed out to sea, far enough to prevent incoming currents and wind from carrying floating portions back to shore, as otherwise the beaches used for bathing become littered with rubbish washed in. The dumping place should also be so selected that the heavy material sinking will not clog up the channels of navigation. It is desirable to use automatic dumping scows, instead of doing the unloading by hand, as the saving in labor will soon pay for the scows.

Plowing into the soil is of not much service, and is applicable only to the kitchen garbage portions of the refuse. The same is true of the feeding of garbage to swine. Some cities have had swine farms, realizing a profit on the venture, while in many villages and small towns, private parties collect kitchen garbage for this purpose.

With the exception of land and water dumping, the other processes require separation of the refuse into different classes. The most complete separation is required in the reduction process.

Many cities employing the reduction process place the removal of their garbage in the hands of private contractors, who either pay the city a lump sum annually for the privilege, or who remove the garbage free of cost to the city, getting it for taking it away.

The city of New York for instance, while it used to pay to a certain company $50,000 annually for the removal of garbage, closed in July, 1913, a contract whereby it receives a total of $487,500 for a five-year period. The city agrees as under previous conditions to deliver the garbage at certain

points of deposit on the water front of the three boroughs, Manhattan, the Bronx and Brooklyn. For this it receives $62,500 for the first year, $87,500 for the second and $112,500 for the third year, and the same amount for each of the succeeding two years, if the contract is renewed, thus making a total of $487,500. The only other bid received by the city was from the garbage removal company in charge which desired a new contract at $130,000 per annum from the city for a period of five years, or a total of $650,000, so that if the contract with the second party proves a success the city actually saves $1,137,500 by the new arrangement. The security required by the city for the execution of the contract is $100,000.

The total garbage delivered for the three boroughs, Manhattan, the Bronx and Brooklyn was 341,739 tons in 1910; 317,992 tons in 1911; and 345,902 tons in 1912.

Garbage contractors, upon receiving the garbage at the dumping grounds, sell certain portions of it to subcontractors. Usually the tin cans, metal, bottles, textile materials, such as clothing, wool and mattresses, and the paper are sold separately, the contractor in many instances receiving for each item as much if not more than the whole cost of the removal. He usually retains for himself the most valuable portions, such as kitchen refuse, vegetable, meat, fat, etc., from which, by various processes, valuable by-products such as fertilizer, oil, grease, etc., are obtained, being worth as much as all the other portions of the refuse put together.

The garbage is first sorted according to the by-products to be manufactured. The grease-producing portions are boiled in digesters and the oil and grease removed; the remainder, called tankage, is used, after being dried and ground, for fertilizer, or burned as fuel in the boilers of the plant.

The grease has a value of from 3 to 4 cents a pound and is sold as a base for the manufacture of cheap grades of pomatums, cheap perfumery and wagon grease.

Such reduction plants should be located in isolated dis-

tricts, as the odor produced is offensive unless the plants are exceptionally well designed and operated. This necessitates a long, expensive haul of garbage, which is a drawback to the method.

Incineration of garbage is a method not as yet introduced to any extent in the United States, but its great advantages are being recognized by city officials and it is making great progress.

In the incineration process, garbage alone cannot be burned without the addition of coal or other fuel, unless it is mixed with ashes or other combustible materials ordinarily found in the refuse.

The best method of disposing of refuse is to separate from the garbage such portions as will produce valuable by-products and burn the remainder with other combustible material, such as wood, paper, etc., separately.

The house and steam ashes should be used, when the garbage is collected, as a means of cleaning the cans. Garbage cans will quickly foul and, therefore, the ash can should be used for garbage and the garbage can for ashes on alternate days, as the ashes act as a cleanser.

The house and steam ashes should be screened at the plant and burned in the incinerator for the purpose of producing steam, which is utilized for heating purposes and the generation of electricity for lighting and power. Such ashes contain high heating values for the reason that the householder and small power plant operators do not know how to utilize the coal efficiently and waste much in ashes. Large cities, particularly, find it advantageous to install combined refuse destruction and electric generating plants to dispose of the ashes.

In a city of half a million population for which the writer was recently called upon to design a refuse incinerator plant, the annual collections of ashes amount to 120,000 tons, or 335 tons daily. After being screened and the clinkers removed, 80,000 tons of ashes remain, equal to low grade coal, having an actual steaming value which, when utilized in the incinerator plant, suffices for the operation

of generating machinery of a total capacity of 6,000 kilowatts. A local electric company contemplates purchasing this power in order to avoid competition, and it will prove especially useful since the incinerator plant is in operation twenty-four hours a day, every day in the year.

The destructor and steam raising plant will consist, in this installation, of four double units, each capable of consuming 84 tons of screened ashes per day, while the electric generating plant will consist of three 2,000 kilowatt turbo-generators. Provision is made to install an additional destructor and turbo-generator, so that one unit may be kept in reserve.

A number of refuse destruction plants have been constructed in recent years throughout the United States, and as the system is one which has been in use abroad for many years, city officials would do well to give the matter their fullest attention.

Such plants are well adapted to municipal operation, and will furnish a large volume of electric current for lighting the streets and for power uses.

The plants occupy but a small land area and can be built to-day in practically any part of the city, as when properly constructed and operated, they prove entirely unobjectionable. They are also a decided success, financially.

(F) Water Supply

Purification Systems; Water Works; Water Distribution; Water Consumption

Among the basic and fundamental functions of a city, there is none of greater importance than that of water supply. However beautiful and attractive a city may be made, if it runs a befouled and death-dealing fluid through its water mains, it is but a whitened sepulchre and a mockery. Murder by wholesale is the result, and a list of victims which would fill many volumes the size of this one, could be compiled of those who have died from diseases arising out of the negligence of the cities in which they were compelled

WATERWORKS AT PEKING, CHINA

Water tower with Klönne type tank of 185,000 gallons capacity

WATERWORKS AT LEUTZSCH, NEAR LEIPZIG

80,000 gallons capacity, 100 feet high

to live; if indeed the supplying of diluted filth instead of water may be termed negligence.

No city without a water-purifying system, unless it has a source of naturally pure water, can in reality have any claims to being considered a civilized place of residence. Millions are spent on pumping plants, yet but little goes for purification. An evidence of the fear in which the water of many cities is held, is shown by the numerous and highly prosperous so-called spring-water companies. The amount of money spent by the individual members of the public of any large city for such water, would undoubtedly suffice for a purification plant for the whole water supply of the city.

The traveller abroad can go from city to city without fear of illness as a result of drinking water, but the traveller in America is in great danger, especially in certain parts of the country.

The essentials of a pure water supply consist of properly controlled catchment areas to collect the precipitation, an impounding storage basin, a filtering plant, and if the supply is not by gravity to the consumer, a pumping station and, finally, the distributing system. For some cities, artesian wells may take the place of catchment areas.

The water at no time should be subject to contamination, especially after being filtered. Where open reservoirs are used, they should be so protected that no possible access can be had to them except by the officials and employees. Provision should be made so that dead bodies will not find lodgment in them, as frequently occurs in many cities.

The purification of water is accomplished by a number of different processes, adapted to the different kinds of water to be treated. Such processes may be briefly classified as follows:

Mechanical separation, which is accomplished either by gravity in the form of sedimentation or by adhesion and screening, as with scrubbers, filters and screens. This method is the one most widely used.

Sand filtration, as compared with the so-called mechanical filtration, is a natural gravity filtration method, slower in action and subject to certain limitations; that is, a greater area for purification is necessary, and it is not successful in clearing turbid river waters of the finely divided clay contents. It is, however, the second most widely used method in the United States and is in Europe proportionately more widely used.

Chemical purification, necessary with water of a certain character, accompanied by the introduction of carbonate of lime, etc., to soften the water, and for the removal of iron and objectionable acids.

Biological processes, accomplished by oxidation of organic matter by its use as food for organisms, which effect its destruction, and by the death of the objectionable organisms as the result of unfavorable conditions artificially produced, such as the absence of food and presence of antagonistic organisms, the remains then being removed by the purification process.

Aeration by evaporation of gases held in solution, the cause of objectionable tastes and odors; evaporation of carbonic acid, a food supply for some kinds of growths; and the supplying of oxygen necessary for certain chemical purifications and especially necessary to support growths of water purifying organisms. Aeration is accomplished by exposing the water in thin sheets to the air, as in falling over dams or overflows, and by pumping it up into the air out of a pipe, as in the form of a low or bubbling geyser.

American cities for the most part draw their water supply from rivers which carry a large proportion of silt and clay. It is therefore necessary to remove such impurities, which are of a purely inorganic kind, as well as to purify the water of bacteria and other organic growth. Various methods and combinations of methods are employed for the purpose. In some plants the process consists of prefiltration, coagulation and final sandbed filtration; in others, coagulation and mechanical filtration; while in others sterilization is employed in addition to the other methods.

In Wilmington, Albany, Philadelphia, Montreal, Steelton and other places preliminary filters are employed, after which sedimentation is allowed to take place, with a final sandbed filtration. This process in time of heavy floods does not work well, as the suspended matter in the water cannot be adequately dealt with.

Coagulants such as sulphate of alumina, or sulphate of iron in connection with lime, effect a coagulation of the particles to a point of sufficient individual bulk to be removable by the sandbed filtration. This method is improved by being used in connection with the sterilization process, as in the application of hypochlorite of lime.

The most efficient method of dealing with American river waters with a high degree of turbidity is that followed by such plants as those at Louisville, Harrisburg, New Orleans, Columbus, Toledo, Cincinnati, Little Falls, New Milford and several hundred smaller places, in which the water is first subjected to coagulation and then mechanically filtered by being forced through filtering mediums under pressure, the filtering medium when clogged being cleaned by reversed currents.

The coagulants have in addition the effect of removing discolorants, tastes and odors, and they are especially effective in these respects when used in combination with aeration. It is, of course, necessary to have the operation of such plants in the hands of competent and experienced engineers, and each installation must be treated on its own merits, as the local conditions vary so greatly.

Another process coming rapidly into vogue, is the ozone treatment. It is an electrical treatment of the water, which produces the effect of aeration in a much more rapid manner than by oxygen. It is much employed on the continent, and an especially notable plant has recently been installed in St. Petersburg, where the capacity is 50,000 cubic meters per 24-hour day, or 13,200,000 gallons.

The water of St. Petersburg is taken from the river Neva, which not only has a very decided brownish yellow color, but which is also heavily charged with the germs of

typhoid and cholera. It has undoubtedly been the cause of epidemics in the past. The plant consists of coagulating and filter basins, electric generating ozone producers and ozone sterilizing apparatus. The coagulating basins are designed of such capacity that the water remains in them for a period of two hours, after receiving the required amount of sulphate of alumina. From this basin the water passes to the mechanical filters of which there are 38 in number, after which it passes to a collecting conduit of reinforced concrete, from which it goes to the ozone treatment plant.

In the ozone plant is apparatus designed to bring the ozone into intimate contact with the water. As is well known, ozone is a form of what may be termed intensified oxygen, and is ordinarily produced in the air by flashes of lightning. In the ozone producers, minute electrical discharges, small flashes of lightning in fact, produce the ozone artificially, and the air heavily charged with ozone thus produced is mingled with the water, oxygenizing the impure matter, which is broken up into gases and disorganized matter, the latter as harmless as sand and the gases escaping into the air, leaving the water entirely pure. The air charged with the ozone is carried into the water-mixing columns, which are fed by the collecting conduit. There are five such ozone sterilizing units, each having a capacity of 3,000 gallons per hour.

Owing to the great interest excited by this plant, and to the fact that the waters of the Neva are of such an unfavorable character, constant tests are made of the results. The plant has been in operation for a year and is highly successful, indeed beyond anything that could be expected of a mechanical filter plant.

Cities having gravity feed water supply are more fortunate than others which must go to the expense of pumping stations and water towers or storage reservoirs to create the necessary head for the distributing system.

In cities in which there is a large supply of water at a low head, a water power plant may be erected utilizing the

water for generating electricity to drive the pumps of the pumping station, thus using the large volume of water at the low head to elevate a smaller volume to a higher head.

The combined electric generating and pumping station may be so dimensioned that during part of the 24 hours, current may be used for light and power purposes, while during the remainder of the time, when this demand has fallen off, the electric pumps may be operated, thus utilizing the equipment of the station to the fullest degree.

In some cities, even, the water power plant may be so favorably located that after the water passes through the turbines, generating electric power, it may still possess sufficient head to pass through the purifying system and distributing mains by gravity. This would be an ideal condition, but it is one seldom realized, though its possibility is too often overlooked by engineers. Such a plant may be economically developed, even at some distance from the city. In laying it out, however, only the most experienced engineers should be retained, as a plant not properly designed may prove uneconomical. The interest on the money invested may amount to more than the value of the electric current produced.

The distributing mains throughout the city should be so laid out that accidents in any section may be confined to a small area. Provision should be made so that an affected section may be readily cut out by by-passing.

In the last decade, the use of steel pipes has come into vogue abroad for city water mains, and cast-iron pipes have been replaced by steel pipes. Steel pipes are lap-welded by the autogenous process, and are not rivetted. They are very much lighter in weight, are made in greater lengths than cast-iron pipes, are much more easily laid and have the great advantage of not being liable to breakage when in place as is so often the case with cast-iron pipes, and thus not only flooding the neighborhood, causing damage and inconvenience, but also exposing large sections of the city to fire risk.

Steel pipes, further, are not liable to leakage, as the

settlement of earth has little effect on them, while with cast-iron pipes, it produces a great volume of leakage which remains undiscovered.

There is great leakage in American city water systems, and the authorities are usually unable to tell what becomes of the water. The quantity of water consumed in certain of the larger cities of the United States and Europe is stated as follows:

Pittsburgh, 220 gallons per capita per day; Buffalo, 310; Philadelphia, 205; Chicago, 225; Salt Lake City, 310; Paris, 65; Hamburg, 44; London, 39; Liverpool, 38; Amsterdam, 37; Copenhagen, 27; Dresden, 26, and Berlin, 22.

European cities, although sprinkling and washing the streets and using water as freely for other purposes, have a much lower consumption, owing no doubt to prevention of leakage, and also, since the water is metered, to prevention of unnecessary waste. The enormous cost to the American cities of the water works required is a serious burden on the taxpayers, and measures should be taken to stop the waste, which may be partially accomplished by remedying faults of construction and operation, and as far as the consumer goes by metering, so that he pays for what he consumes. This proves the easiest, most equitable and most effective system.

The Department of Water Supply, Gas and Electricity of New York has issued a bulletin with figures and tables that show a reduction of 60,000,000 gallons in the daily consumption of water in Manhattan and Bronx as a result of the campaign against water waste during the protracted droughts of 1910 and 1911. The economy was accomplished by a house-to house inspection in quest of the small and usually ignored leak, and by spreading instructive literature on the subject of water waste.

The work of the water waste division of the Bureau of Water Supply, it is now announced, has resulted in a direct saving, since it was started in 1910, of 15,000,000,000 gallons of water, which, at meter rates, would represent about

FOUNTAIN PAOLINA, ROME

TERMINAL FOUNTAIN TREVI, ROME

Splendid examples of classic architectural embellishment, symbolizing city water supply

WITTELSBACH FOUNTAIN, MUNICH

An ornamental and symbolic terminal of the city aqueduct

$2,300,000, while the cost of the work amounted to only $90,000.

The water supply system of a city should be utilized in the design of the city to produce æsthetic effects, being peculiarly well adapted for such purposes.

In many cities water towers of a highly ornamental character may be erected, constructed of reinforced concrete, steel or masonry. Attractive towers of this kind should be erected, whenever possible, instead of the unsightly steel towers or standpipes so commonly put up.

Cities which draw their supply of water from distant watersheds may find it of advantage to conduct it through an aqueduct which, when led across valleys, offers great opportunities for effective architectural treatment. A surplus of water may be drawn from the watershed to be used at some selected point, forming an artificial cascade and waterfalls, while a highway may be built on the aqueduct.

Where water is supplied from sources requiring pumping stations, these should be of well-designed monumental character. In the city itself, as an architectural symbol of the water supply system, there should be erected monumental terminal fountains. These should be either in the form of geysers or cascades, and they are susceptible of a high degree of architectural ornamentation. Such fountains are extremely popular in European cities and form most interesting and effective features in the city planning.

In Rome the terminal fountains of Aqua-Paola and the Fontana Trevi, and in Marseilles the fountain of the Palais Long Champ, are excellent examples; while German cities abound with similar works in modern style, for example, the Wittelsbach Fountain at Munich, which consists of a basin 82 feet in length and 42 feet in width, from which rises a pedestal bearing four masks, symbolical of the different "temperaments" of water. On the top of this is a basin 18 feet in diameter, and above this a smaller basin from which the water issues. On the right and left of the lower basin are two colossal groups in marble, 10 feet high and 13 feet wide; a female figure upon a water-bull and a male figure

upon a water-horse symbolizing respectively the fertilizing and destructive power of water.

A well-known monumental water tower is that at Mannheim, Germany, in which the tower is utilized as an ornamental structure in the center of the city, surrounded by parking and fountains.

While city water supply systems are strictly engineering propositions, it will be seen that opportunity is afforded for utilizing not only the art of the architect but also that of the sculptor in symbolizing the city's possessions and the means of supplying its citizens with one of the most important of all the necessities of life — water. The displaying of the city's water in this way in the most attractive manner serves not only as an embellishment of the city, but has a most important hygienic effect, since if the displayed water is seen thus publicly to be muddy and impure it will arouse public opinion to the point of action, and insure the obtaining of a supply of pure water which the city will not be ashamed to show to its citizens and visitors.

The building of a monumental fountain in New York, for example, at a cost of $160,000 would provide the city with an attractive structure, perhaps the greatest of its kind in the world, yet its cost would be but $\frac{1}{1000}$ of 1 per cent of that of the aqueduct system which the city is now constructing at a cost of $160,000,000.

(G) Gas Supply

Coal Gas; Water Gas; By-Products; Gas Pressure; Gas Distribution

Gas, one of the oldest of modern street lighting systems, although hard pressed by the advance of electricity, has reached a point beyond which it is not likely to be driven. This is principally due to the fact that great inventions have been made, producing a marked improvement in the brilliancy of gas lighting, and to the development of the use of gas for heating purposes.

As in the case of steam power plants, gas plants should

be located on a water front, and should also have railroad connections, in order to be accessible to supplies of coal.

Owing to the great size of the holders, gas plants have never been made acceptable in an architectural sense, and they should therefore be located in the outskirts of the city, or in factory districts where their ugliness will not be so noticeable. If this is not feasible, they should be painted a silver slate color instead of the usual red, to render them less conspicuous.

The general equipment of the generating plant consists of retorts, mechanical handling apparatus for coal, the machinery for charging retorts, apparatus for obtaining the by-products, such as tar, ammonia, oxide, sulphate, lime, and cyanogen; and the auxiliary machinery such as scrubbers, purifiers, etc., all of which should be well arranged and grouped in a compact manner in order that the plant may be operated in an efficient and economical way.

The demand to-day is for a gas having as high a calorific or heating value as possible, as well as a high illuminating value, where a few years ago the demand was principally for illuminating power. This change has been brought about by the increased use of gas for cooking and in the arts. Coal gas should have a heating value of not less than 550 British Thermal Units per cubic foot, while water gas is usually higher. In many towns a combination of coal gas and water gas is used. For instance, in New York, where this plan is adopted, recent tests made showed an average of 756.2 British Thermal Units and an average illuminating power of 28.8 candle-power.

Water gas is produced by the decomposition of steam in contact with incandescent carbon. The process consists in alternate "blows" with air to heat the fuel, and "runs" with steam, which is decomposed by the incandescent fuel, continuing to form water gas until the temperature becomes too low, necessitating another period of heating.

In the carburetted water gas process, the fuel in the generator is burned by the air blast only to a sufficient degree of heat to form principally carbon monoxide. Another

process much in vogue in Europe produces about twice as much water gas for the same amount of fuel. In this process the volume of air during the blows is so proportioned to the bed of fuel, and the apparatus is so designed, that instead of carbon monoxide, carbon dioxide is formed, developing three times the heat from the fuel that is developed when it is burned only to carbon monoxide. In this process, coke is therefore converted into water gas with a maximum of economy, transferring to the gas about 70 per cent of the heating value of the fuel.

It is the practice abroad to use seamless welded steel tubing for the distributing mains, instead of cast-iron pipe. The steel pipes have for gas mains the advantages similar to the use of steel pipes for water mains, already pointed out. They are lighter in weight, easier to handle, have fewer joints, are not subject to breakage and when laid are free from leakage, besides lasting longer.

What has been said about the general arrangement of water mains and by-passing is equally applicable to gas mains, in order to prevent leakage and inconvenience. Where gas pipes enter buildings, there should be accessible cut-off valves, so that in case of fire, the fire department may cut off the supply of gas for that particular building.

Owing to the numerous improvements the intensity of gas illumination to-day runs to 5,000 candle-power and over in single burners.

The gas is also distributed under much higher pressure than formerly. The city of Berlin has systems in operation as high as 17½ pounds per square inch. This pressure is obtained by the use of turbo-driven turbo blowers.

In New York City, a recent order of the Public Service Commission increases the pressure at the point of use by the consumer from one and one half inches water column to two inches water column. One inch water column equals .58 ounce, one and one-half inch water column equals .82 ounce and two inches water column equals 1.16 ounces pressure. The Commission's order also requires that a difference of not more than ¾ inches water column shall exist

in the variations of pressure from day to day. Special requirements are made as to momentary pulsations and variations of pressure, which are to be obviated by the use of regulating apparatus. Such variations are usually caused by the use of gas by gas engines, of the hit and miss type, which do not take a regular supply of gas from the mains. The effect of the Commission's order will be to improve the brilliancy of the lighting and give greater and more regular heat at the burners. The orders will require improvements to be made in the gas mains and will require three years to effect.

Another practice employed abroad is to light whole sections of the city simultaneously. This is accomplished by an automatic lighter for each lamp post, which is caused to operate by slight changes in the pressure. These changes are in the mains and are controlled from a central point. The lights are extinguished simultaneously by the same method.

(H) Electricity Supply

Steam- and Hydro-Electric Plants; Internal Combustion Engine and Combination Plants; Size of Machinery; Electric Current Distribution; Central Station Service

Municipal ownership of public utilities is becoming more and more general in the United States, and a large number of cities already have their own power plants, which is, of course, one of the most important members of a group of public utilities.

Such plants are used for furnishing electric current for city traction, street and municipal building lighting and power purposes, while in the cases of many cities, current is sold to private consumers.

Municipal power plants should be designed to supply the current required under existing conditions, and to be capable of ready extension when made necessary by subsequent demands for additional current, but at the same time, in order to insure financially successful results, great care should be taken not to make the plant larger than neces-

sary, since interest and sinking fund charges on idle equipment or on too large an equipment will make the city's current unduly expensive.

In the selection of the equipment, also, the greatest judgment is requisite, since the most expensive equipment is by no means necessarily productive of the most efficient results.

In the designing of a plant, advantage must be taken of the latest advances in engineering, and especially so in order to obtain the greatest degree of economy in operation.

Electric current for municipal purposes is generated chiefly by steam, oil, gas or water power. Of the four methods, steam is the most widely in use, but local conditions are the determining factor in the selection of the best source. A city, for example, in which coal is expensive and in which a water power is at hand, will, of course, choose a water power plant, unless the overhead charges will outweigh the advantages of the water power.

If a steam generating plant is selected, it should be located on a water front, in order to handle coal and ashes on barges, and to have at hand an ample supply of water for condensation. When the water of the stream is suitable for boiler feed purposes it may be used, but otherwise water for the purpose should be taken from the city mains, or from wells.

The lot chosen for the plant must be large enough to provide for future extensions, and there should also be ample space for coal storage, to guard against interruption of supply, due to strikes on the water, railroads or at the mines.

Coal should be purchased on the basis of its heating value, and it should be weighed when delivered. In order to cut down the cost of labor to the minimum, the unloading should be done by automatic machinery.

The arrangement of the power plant should be adapted to the machinery to be installed, and to the size of the plant. For example, a plant of 15,000 kilowatt capacity should be made up from four to five prime movers, and each prime

mover should have its own boilers and auxiliary machinery, so that the whole plant will be divided on the unit system.

For example, in the power house of the New York Subway system, with the entire design and construction of which the writer was associated, the equipment is divided into ten units. Each unit consists of six boilers, two economizers, one 5,000 kilowatt main high pressure reciprocating engine, one 5,000 kilowatt low pressure turbine, receiving the exhaust steam from the reciprocating engine, one condenser, one boiler feed pump, one circulating pump and one air pump.

The boilers of each two units possess in common one smoke stack, and the piping system is so arranged that any set of boilers can feed any main prime mover.

In another plant, designed by the writer for the Potomac Electric Light and Power Company, Washington, D. C., which has a capacity of 25,000 kilowatts, while the boilers are arranged at right angles to the generating room, the unit system is taken advantage of throughout the plant. This plant is considered the most economically operated plant in the United States, and it embodies a number of European features of value.

The unit system renders the first cost lower, and insures a more flexible and economical operation. The steam piping should always be arranged so that any set of boilers may be used to feed any of the prime movers.

As the steam piping is regarded as the arterial system of the plant, it should be laid out as simply but as flexibly as possible, in order to avoid delay in by-passing when sections have to be cut out.

This is equally true of the bus bar system in the switching room, which receives the electric current from the generators. The voltage adopted for the generators depends on the location of the plant. If it is located in the vicinity of the current consumption, low voltage, direct current may be chosen, but if located at some distance from the point of consumption, high voltage, alternating current must be selected.

The current, if used for lighting only, should be converted from alternating into direct, and while this is a somewhat more expensive system, it gives steadier light than if such conversion is not made. If the current is used simultaneously for local and suburban railway systems, in order to avoid the installation of different kinds of apparatus, alternating current is also used for lighting, but in such case, the cycle chosen should be not less than 25 per second, in order that fluctuations of the light may be avoided. While 15 cycles per second is considered desirable for traction, and 60 cycles for lighting, yet when the current is needed for both purposes, a medium number should be chosen. Some cities have a cycle frequency of 32½ and 42.

Within the last few years many plants are utilizing the exhaust steam from the engines for steam-heating of buildings in entire districts in winter, and for ice making in summer, the ice being sold to the public at a lower price than it could be sold by other producers. Thus the plant is made much more profitable.

It will be seen that no little technical experience is required in selecting the best form of equipment for any particular installation, owing to the various conditions to be met.

Many cities are fortunately in position to take advantage of water powers, but in order to successfully utilize such powers, it is necessary to give the subject an exhaustive preliminary study and investigation to ascertain particularly the volume of water which may be available during the whole year. Government reports, though reaching back long enough, often some 10 or 15 years, must not be accepted without corroboration, nor should the hearsay evidence of local residents be blindly accepted, as many water power installations have proven failures through insufficient water supply, while others have been wrecked by floods when erected without sufficient reliable data at hand as to what was to be expected.

Thorough investigation should also be made as regards the financial aspect of the development. In some plants, the

harnessing of the water involves so great an investment, that the interest and sinking fund charges are greater than the value of the current generated.

The fact that the location of the water power site may be at a considerable distance from the city is of much less importance than would appear to the lay observer. A site 50 miles or more away may be readily utilized, and in fact, so great have been the advances in engineering science, that power is to-day economically transmitted 200 miles or more.

Cities within practicable distances of such power sites should not neglect to obtain the rights to them, whether contemplating immediate use or not. The State of New York has under consideration the utilization of the various water powers throughout the state, in a manner similar to that undertaken by the Canadian Government through the organization of the Hydro Electric Power Commission of Ontario, which has charge of the long distance transmission distributing system of Niagara power in the Province of Ontario.

The writer was retained to make a report on the entire Canadian governmental undertaking, the results of which cannot here be quoted as the report is too lengthy for the purpose. It may be said, however, that the practicability of high voltage long distance transmission is amply demonstrated and that cities should not hesitate to take advantage of natural resources, even when located at considerable distances, provided other features are such as to make the projects advisable.

In constructing water power plants, the determination of the type of turbine is of great importance, in order to obtain the highest degree of efficiency. Drawing the line, for example, between a low head and a medium head, or a medium head and a high head turbine, may often mean from 5 to 10 per cent difference in efficiency of the plant. As a general rule, a low head turbine is adapted to utilize large quantities of water falling but a short distance, while a high head turbine will produce an equivalent power with much

less water, if it falls from a greater height. The former will be a low speed turbine and the latter a high speed machine. Just what type to select for water of a given head in a given volume is one of the many questions which the engineer must decide and one upon which may depend the whole success of the undertaking.

The number of penstocks used for the entire plant depends much on the general arrangement of the plant, its situation with reference to the collecting basin and the type of machinery selected. It is good practice, when the plant is large, to install several parallel penstocks, so that in case of breakdown of one, the others will supply water to the turbine generator sets.

In designing and constructing the dam, the utmost engineering skill is requisite, and the penalty of employing inexperienced engineers has been shown by the numerous breakages of dams in the recent past.

What has been said in reference to the size of the prime movers, in order to carry economically light and heavy loads, and the flexibility of the switch gear, the voltage and frequency of the generator, in steam power plants, is all equally true for hydro-electric plants. It is beyond the scope of the present work, of course, to go into the detail construction of such plants, particularly as the subject has been fully covered in the author's books, "Steam Electric Power Plants" and "Hydro-Electric Developments and Engineering," which deal with the theory and practical side of the latest American and European practice, and which embody the results of his experience in the design and construction of plants aggregating some 300,000 horse-power.

In addition to steam and water power plants, the internal combustion engine, whether of gas or oil, is made use of. Fuel in the form of oil, or gas from the city mains, natural gas, producer gas or the waste from coke ovens or blast furnaces may be utilized.

The oil engines have reached a state of such perfection that from 10 to 15 horse-power per hour can be developed from one gallon of crude oil and oil of this character can be

Municipal gas works, Frankfort-on-the-Main

Municipal electric generating and district steam heating plant, Dresden

EXCELLENT EXAMPLES OF CO—OPERATION OF ENGINEER AND ARCHITECT

had at from 2 to 6 cents per gallon, depending on the quantity purchased.

The first cost of an oil engine plant is comparatively low for the simple reason that there are no boilers, very few pipes, and but a small building, while no large machinery is necessary for handling fuel, one or two tanks for storage of oil alone being required.

The operation of such a plant is simple. It can be started on five minutes' notice, and after the power is shut off the running charges cease. Due to these advantages, the oil engines are particularly adapted for supplementary installation in steam and water power plants, to carry peak loads, which usually come twice a day and are of but short duration, but which must be met by equipment which lies idle at other times or is not fully utilized.

The question of municipal power plants is not only one which must be considered in its technical phases, but one which involves administrative problems as well, and unless a city is efficiently administered, it may be wiser to obtain its power from local power companies than to attempt to install and operate its own plants. Before final action is taken, it is advisable to have a thorough expert investigation and report made upon the subject in each case, by a competent and disinterested engineer.

(I) Electric Street Railways

Systems of Railways; Sub-stations; Car Barns; Railway Equipment and Operation; Financial Aspect

In the operation of a street railway system, the equipment will depend, as in the case of the power house, upon the conditions to be met.

If the system is a local one, direct current at 600 volts should be adopted; but if the lines run into distant suburbs, the best current to adopt is the single phase and the voltage may run to 10,000 or 15,000, thus reducing line loss.

The equipment of the cars should be such as to run on either the 600 volts direct current in the city, or on the

single phase, high voltage current in the suburbs, thus passing to and from the city without interruption.

The sub-stations for stepping down the high voltage current should be well situated along the line to obtain the most economical power distribution. They are preferably located around the outskirts of the city, on the various lines, so that high voltage current will not be brought into the city. The distribution system in the city itself should be underground, a method which though more expensive than the overhead distribution system is otherwise preferable, due to the many advantages it possesses.

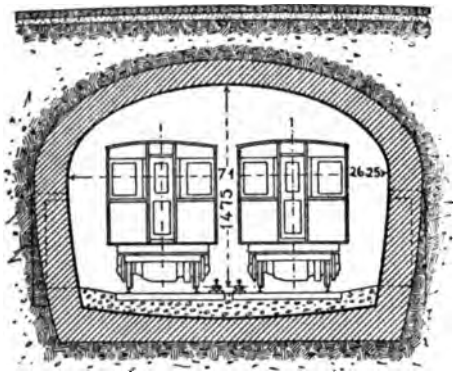


FIG. 70. CROSS SECTION OF THE METROPOLITAN SUBWAY, PARIS

Car parks or barns for storing cars, either in the open or under roof, while in some cases of necessity located at convenient points along the main traffic lines, should be arranged in such a manner as not to be architecturally unsightly. They should be of such a character as to harmonize with the surroundings, if not to be an improvement upon them, since they are at best a nuisance and an impediment to traffic. The company should maintain strict discipline and not have large crowds of motormen lounging about the streets to the annoyance of the public. The streets are for the use of the public and not for the transaction of the business of private corporations.

In most cases it will be possible to have car barns located at or near the ends of the lines, while in other cities, large union stations, serving at once for passengers and for car storage, may be erected.

In developing a comprehensive traffic system, thorough study of the flow of traffic should be made, and its probable increase taken into account. Where the traffic is heavy or likely to grow to large proportions, especially where the haul is long and heavy, the question of subways and elevated

roads should be considered, even though the necessity is not imperative, as such rapid and convenient means of transit to outlying districts will have the effect of developing such sections and of causing the city to expand much more rapidly than would otherwise be the case. The same is also true, to only a less degree, in the case of suburban trolley lines.

In the development of a traction system, much depends on the comfort and convenience of the travelling public. The equipment should be up to date and attractive in every respect. Cars should be of appropriate design and of neat appearance. Means of access should be easy, the seats should be comfortably designed and preferably crosswise in the car, as the public is paying for a seat and should have a seat and not a crowded bit of a side bench or a strap to hang on by.

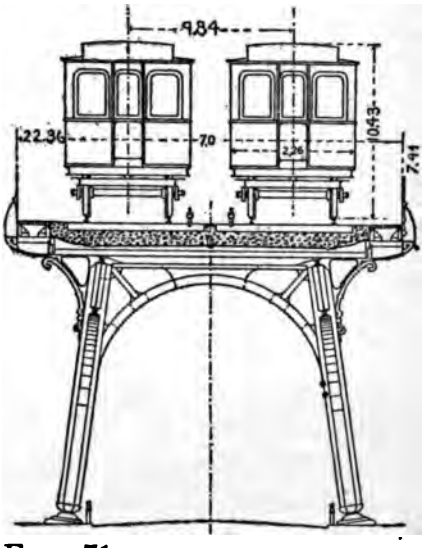


FIG. 71. CROSS SECTION OF BERLIN ELEVATED RAILROAD

Showing solidly constructed road-bed beneath which is a Promenade. This structure is popularly known as Berlin's Umbrella.

A new form of car is being experimented with in New York which promises to supersede the old forms of cars to a large extent. Its floor is but six inches above the rails and entrance is through side doors in the middle. This car has the advantage of being a pay-as-you-enter car and one which the passengers cannot enter or leave while it is in motion. One of the most fruitful sources of accidents is thus done away with. Its seats are arranged crosswise and small posts are provided for those who must stand, a method superior to straps. The car is pleasing in appearance, and is the most radical departure that has been made in street car construction in this country for a long while. The experimental cars have proven so satisfactory that the company has ordered 150 more of the type.

Abroad, it is customary for companies calling for bids on electric traction systems to receive not only specifications of cars, but also detailed designs, showing color schemes and interior decorations. The companies are thus in position to select the most pleasing and effective designs of cars instead of taking whatever car manufacturers may be pleased to turn out.

In handling traffic, the convenience and interest of the public as well as of the operators is best served by having a uniform fare rate, instead of a variable scale of fares, and by the issuance of transfers at all intersections. Such transfers should be issued at the time demanded by the passenger, though preferably when entering the car if the ingress of passengers is not thereby interfered with. If demanded on leaving the car, traffic is likely to be delayed.

Abroad, passengers are seldom allowed to stand in cars and operators are obliged to supply sufficient cars so that there will be seats for all. On paying his fare, the passenger gets a ticket with the destination punched, similar to our system of railroad tickets, and this ticket in many cases entitles the passengers to reach his destination over any lines that intervene. It serves also as a transfer and must be exhibited to the conductor whenever demanded.

Other principal features of street railway traffic such as the arrangement of lines, central transfer systems, surface traction, elevated and subway traction, moving platforms and statistics of rapid transit have been treated at length in Chapter IX, Traffic and Transportation.

It is often asserted that cities cannot operate public utilities as economically as can private corporations, but that this is not true is amply proved in practice. A good illustration is seen in the street railways of Sheffield, England.

In 1896 the corporation of the city of Sheffield took over the street transportation of the city as a municipal undertaking and has since demonstrated beyond dispute that its street railways, at least, can be operated at a handsome profit, pay good wages, and accommodate the traveling public all on a basis of 1 penny (2 cents) fares.

The present system has open for traffic over 48 route miles of track, of which 38 are double. The construction, both of track base and overhead equipment, is claimed to be of the most approved, modern and durable nature.

Those operating this enterprise fulfill the most advanced theories of consideration for workmen by providing mess rooms where meals are served at cost, reading and billiard rooms, lavatories, and comfort facilities. Wages, in cents per hour, are: Motormen, 13½ on joining; 14½ after 6 months;

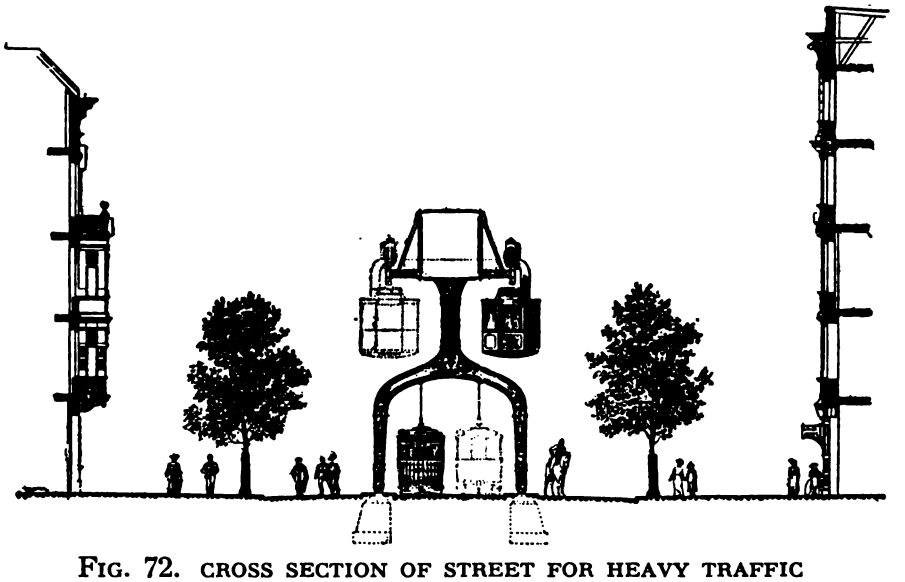


FIG. 72. CROSS SECTION OF STREET FOR HEAVY TRAFFIC

Showing two Street Car Lines and Suspended Elevated Railroad System

15 after further 6 months; 16 to 17 for special work, with small increase for merit of long-term service. Conductors, 11½ on joining; 12 after 12 months; 13 after further 6 months, with small increase for merit after long-term service. Inspectors, $9.75 to $10.70 per week.

The service commences at 4.15 A.M. from the depot and finishes at 1 A.M. at the depot. The average frequency of service is 5 minutes, with cars as close as 3 minutes on busy lines during rush hours. The average speed per hour, including stops, is 7.4 miles, whereas the maximum speed allowed is 16 miles per hour. The average fare per mile is

0.772 cent. The regulation fare is 2 cents, but there are 1-cent stages throughout the business section of the city, which range from one-half to three-quarters of a mile. These are to the most-used points out from the heart of the city. There are fixed stopping places throughout the entire system, which are approximately about 1 furlong (one-eighth mile) apart. The local public uses the tramways to the extent of 207 miles per head of population per annum.

For the year just passed the Sheffield Corporation ran its street cars over more than 8,000,000 miles and carried approximately 100,000,000 passengers, an average of 11.935 passengers per car-mile, at an average fare per passenger of 1.808 cents.

The average total revenue per car per mile was 21.783 cents, as against an average working expense per car per mile of 12.506 cents, giving a balance net revenue per car per mile of 9.27 cents, or on the total system for the year a balance net revenue account of $763,855. Of this, about $390,000 was appropriated to pay interest on borrowed capital and for a sinking fund to redeem mortgages, stocks, and bonds; about $145,000 is applied to a reserve fund for renewals, repairs, and improvements, and the remaining $228,855 paid over to the city during the fiscal year for reduction of municipal taxes and sundry general improvements.

Since 1899 the tramway has paid over to the municipality of Sheffield in relief of district taxes and in grants for municipal improvements more than $2,000,000, which, considering the low rate of fares, wages paid, and the efficiency of service rendered, is an excellent showing.

CHAPTER XIX

VALUATION OF PUBLIC UTILITIES

Basis for Valuation; Physical Factors; Equitable Adjustment; Confiscatory Valuation; Valuation in City Planning

WITH the growing tendency of municipalities toward public ownership of public utilities, and especially the tendencies to either take over existing plants or to stipulate rates and charges, the determination of the true value of public utilities becomes of great importance. When charges to the public for service are fixed on the basis of allowing the operating company to earn a certain rate of return on its invested capital or on the going value of the concern, any improper valuation will act as a fraud on the public, and it is, therefore, necessary that the vaulation be made by impartial experts and in the most thorough and careful manner possible.

Similarly when the city levies taxes or acquires properties or fixes limits or grants authorizations for new issues of stocks or bonds, the correct valuation of the property is essential, while when arrangements are made to take over property at the end of a term of years, or when adjustments of rates are to be made at fixed periods, the methods of valuation should be prescribed and faithfully carried out.

When uniform systems of accounting are prescribed, the question of valuation should be settled and a proper basis for the opening of the books of account provided.

Further, in the matter of assessments for purposes of apportioning the cost of public improvements, such as the widening of streets and cutting through of new streets, the question of valuation is of the first consequence.

Valuation, thus a matter of the greatest civic importance, is essentially a judicial matter, consisting in arriving first

at as complete a knowledge of the facts as possible and then an equitable decision in the light of the facts disclosed. It is one of the processes of justice and those having charge of valuation should be of a judicial temperament, not likely to be swayed by prejudice and of course wholly above the suggestion of ulterior motive.

At the same time it is very necessary for those in charge of valuations to have ample experience and a thorough knowledge of the numerous devices of corporation bookkeeping so that they may be equipped to ascertain the facts in the case and not be deceived by corporation managers.

In making a valuation for a property and such a valuation as will be fair and equitable, many complicated considerations are encountered. The basis of the valuation must be fixed and three principal methods are employed for this purpose:

The determination of the physical value of the property.

The determination of its earning capacity.

The determination of the value of its good will.

Taking for example the water supply system of the city, the physical value of the property may be approximately fixed by ascertaining

(*a*) The cost of replacing the system by a new one.

(*b*) The cost of the original system.

(*c*) Deduction of depreciation of original system.

The cost of a new system may be either more or less than the cost of the original, depending on labor, market and other conditions, but after estimating the cost of a new system, deduction should be made for the depreciation of the old system, as a new system would be obviously more valuable than the existing one.

The cost of the original system may be ascertained by the records of the construction work or from other sources, or if these are not obtainable estimates may be made. The books of a corporation are not always an accurate index of the original cost of a public utility, for various improper charges may appear such as exorbitant salaries of officers, padded pay rolls, charges for equipment and supplies never

CASTLE PLAZA AND EVANGELICAL CATHEDRAL, BERLIN

BURG THEATRE, VIENNA

Auxiliary civic centers dominated by prominent structures

purchased and other fraudulent entries made for the purpose of cheating either the corporation, the public or both.

The real value of a public utility is shown better perhaps by its earning capacity than in any other way. If a change of ownership occurred between private owners, the barter price would be largely determined by the amount of dividends that could be derived from the operation of the property, while at the same time its depreciation charges were being met.

Taking for example a water supply system costing $5,000,000 to install, having been in operation for ten years without depreciation having been charged off, and showing a yearly profit of $1,000,000; the question would arise as to whether the valuation should be based on the cost less depreciation or on the earning power, and if on the earning power, what rate per cent of profit should be allowed the owners?

Allowing a depreciation of 5 per cent per annum the present value would be $2,500,000. If that amount, however, be the only investment allowed, the profits of $1,000,000 a year would be $750,000 net or a 30 per cent profit on the physical valuation of $2,500,000.

However, it is obvious that the owners are entitled to more than the mere physical valuation, since other factors cannot fairly be neglected. Their investment is yielding $750,000 per annum. Their claim would be that on the taking over of the property they should be reimbursed in a sum which would net them a return of $750,000. They would be likely to claim a valuation at low percentages. Thus if they claimed a sum which at 4 per cent would yield $750,000, it would be necessary to pay them $18,750,000 for the property, while if the city allowed them on the basis of 6 per cent it would be necessary to pay them only $12,500,000 for the property. The difference between the physical value and these income valuations would represent good will, development work, value of franchises and a certain profit for the risk involved. The public, however, would by no means care to pay twelve or eighteen million dollars

for a property physically worth only two and one-half millions, and would in a physical valuation lose sight of the elements of risk, franchises, development and good will, and if only rates were at stake and the question of taking over the property not involved, would probably demand a reduction of rates to a point where instead of showing 30 per cent on $2,500,000 the company could only show 5 per cent or 6 per cent over depreciation, or some $125,000 to $150,000 profit.

The corporation would no doubt, however, in the meantime have capitalized its venture at some $50,000,000 in stock which selling to the public on the the basis of $30 per share of the par value of $100, would show a dividend of 5 per cent on the market price of $30, although back of it there would be only $2,500,000 of actual physical value.

Most public utilities are in some such condition as this. The watered stock has been sold to certain members of the public who have bought innocently supposing the stock to be worth the market price, if not in physical value then in good will, going value, franchises and risk overcome. The promoters have long since taken their ill-gotten profits and have left the purchasers of the stock in possession of the property. The latter have paid far too much and the general public, feeling the pinch of the high rates, is either compelled to go on paying the high rates, or, to reduce the rates, to take the property over at a valuation which will mean enormous losses to the stockholders who purchased in innocence of the true state of affairs. The general public in permitting such an inflation of the stock issues is tacitly a party to the fraud, but when finally aroused it finds no one at hand on whom to wreak vengeance save the innocent stockholders partially deceived by the apathy not to say connivance of the general public itself.

The public feels that the corporation has no right to demand dividends on franchise values granted by the public itself and the tendency is strongly in evidence to override any possible rights of the stockholders and trim rates and valuations down to a strictly physical basis.

This is a course which, however beneficial it may prove to the public at the outset, will involve serious consequences later on, since investors of capital expect a greater profit from their money than that to be derived merely from a property physically equal in value to their investment. The risk of loss entitles them to a greater profit and there are the costs of organization and development which are absolutely essential but which are not represented by anything having a physical value. They are also entitled to a certain profit on the successful carrying through of such work and on the good will, or the tendency of the public to continue to patronize the service. They are entitled to such profit because they could have made it had they placed their money in a private enterprise.

If the general public is to obtain money for further improvements, it must be sufficiently liberal in allowing profits to those who have invested, to attract new investors to its enterprises.

Practically all public utilities throughout the United States are encumbered with issues of watered stocks. The promoters having seized their profits through successfully incurring the risks involved, and through having capitalized franchises costing little or nothing at millions and good will long before it came into existence, can no longer be held to account. Their work is done, whether for good or ill, yet the public should not punish the innocent but should allow a full and fair if not a liberal reckoning, for there is also a prospective value to many such enterprises. That is to say, if allowed to develop along the lines planned, they are likely to become in time as valuable as the par value of the stocks issued against them by their promoters, and the public by cutting down valuations to a physical basis is in reality confiscating both realized and future legitimate profits, for it must always be borne in mind that if invested in private undertakings, the capital involved would probably have shown a higher return than in the public utility enterprises.

In taking over a property, or in fixing rates, therefore,

the public should not take advantage of its power and position and fix confiscatory terms, unless perhaps the original swindlers are still in possession, but should pay as much for the utility as it would be worth fairly in the market, or if rates are to be fixed, use such sale sum as the basis of the investment on which the rates are predicated.

It will be seen that the question of valuation of public utilities is highly complicated and involved and that it accordingly requires the most careful and impartial attention, in order that a fair balance may be struck between the public on one side and the stockholder on the other as regards both the physical valuation itself and the more intricate subject of extra physical valuation.

Valuation is a highly important factor in city planning, for in order to proceed intelligently, it is necessary to know the value of the property affected. Although cities are already more or less roughly valued for purposes of taxation, they should, prior to any extensive improvements, have thorough valuations made, including all municipal and utility properties such as public buildings, water works, gas, electric and other systems, transportation lines, and all public and private real estate. With a complete and accurate valuation at hand improvements may be undertaken with an exact knowledge of what the cost will be and how it will be met. Without such valuation, expensive mistakes are likely to occur and the greater part of the benefits lost.

CHAPTER XX

FINANCING CIVIC IMPROVEMENTS

Distribution of Costs; Excess Condemnation; Apportionment of Assessments; Commission of Assessment and Condemnation

THE first cost of the replanning of a city is the principal obstacle which has to be overcome. Although there can be no question of its ultimate value and almost incalculable value to the city, yet the problem of securing the necessary capital and the proper distribution of the burdens and the benefits to be derived requires careful and competent financing.

While cities like Paris, London and Berlin have spent and are spending hundreds of millions of dollars on improvements, they are only able to do it at the cost of considerable additional burdens to the taxpayers, which in smaller cities though proportionately less would still be insupportable.

A just and proper distribution of the cost should proceed on the theory that those benefited should bear the cost. In city planning, those benefited are the property owners directly affected and the whole body of citizens not only of the present generation but of future generations. It is therefore proper to place the cost of the improvements on the property owner immediately benefited by means of assessments or otherwise, on the whole body of citizens by an increased tax rate and on the future generations by the issuance of long-time bonds.

The utmost care should be taken, however, in the arrangements adopted to prevent profits by land speculators and to obviate unnecessary burdens on the taxpayers.

The principal methods adopted are those of assessments, gradually decreasing in extent with the distance of the

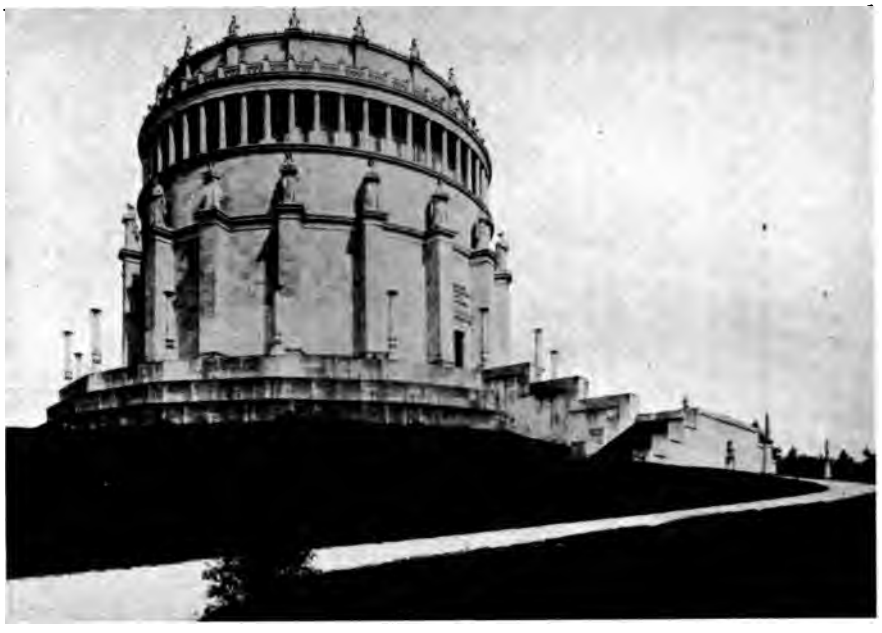
property from the improvement, and the more recent plan of excess condemnation.

In European cities where excess condemnation is practiced, the city purchases by condemnation proceedings not only the land needed for the proposed improvements, whether it be for a street, a park or other purpose, but in addition as much more land as is likely to be increased in value by the improvements. After the improvements have been made, the land is held and sold from time to time, to the best advantage, or it is developed and held by the city for a long period until a favorable opportunity arises for its sale.

Excess condemnation is highly desirable for sites of schools, parks and the like which are in contemplation, as the city may hold the land over a long term of years in advance of its utilization, and be saved the high cost of sites whose purchase is delayed until the city is built up.

Excess condemnation, however, as a means of paying for the cost of improvements is open to serious objections. The enhancement in real estate values after the improvements are made, is seldom more than half the cost of the improvement, besides which there is the interest on the bonds and the loss of taxes that would have been paid by private owners on the land so condemned. In order to obtain the full cost of the improvement from the increased value of the land, the city would have to improve the property and hold it over a term of years until the full value of the improvement was realized, for the immediate enhancement of land values does not, of course, represent the full benefit of the improvement. In addition, a large improvement of this character is likely to demand the marketing of bonds far beyond the city's borrowing limit, although if the property is productive, the borrowing limit should be raised to include it.

The most direct method of assessing the property owners offers advantages over the excess condemnation system particularly when all the property benefited is assessed, even though it is at a considerable distance from the loca-



HALL OF LIBERTY, REGENSBURG (RATISBON)

BAVARIA MONUMENT AND HALL OF FAME, MUNICH

Examples of great memorials containing numerous monuments to military heroes. Memorials of this character attract large numbers of visitors. Numerous opportunities exist for similar structures in the United States.

MONUMENT OF EMPEROR WILHELM I., BONN
Erected at the junction of the rivers Mosel and Rhine

KYFFHÄUSER MONUMENT IN THE HARZ MOUNTAINS
Erected by the German military associations at a cost of $200,000; to the left a ruined castle

tion of the improvement itself. As the purpose of excess condemnation is simply to enable the city to reimburse itself for the cost of the improvement by the benefits derived therefrom, assessment proves to be a method for large improvements, just as equitable and effective since those benefited pay the sum directly to the city, instead of having to sell their property to the city and then perhaps buy it back again.

Direct assessment, however, is open to many serious objections, for the amounts must be arbitarily fixed and may and may not prove fair. Further, the property owners must obtain the capital immediately and the amount is thus withdrawn at once instead of being distributed over a term of years as in the sale of bonds.

Experience is necessary in assessing property, since the property owners are entitled to have the burden equitably adjusted and to know in advance what they will have to pay. The assessments should not decrease in direct proportion to the distance from the improvement, but in a more sharply decreasing ratio, the most equitable for which should be obtained and applied by those who are called upon to make assessments.

The only American state to authorize excess condemnation is Massachusetts. Although presented to the voters of New York as a constitutional amendment, it was rejected.

Legislation, too, on the subject of excess condemnation should not be undertaken without careful study and preparation. The lack of clearness in the Massachusetts law should be avoided, leaving as it does, unsettled, the question of the right of the city even to replace fronts on buildings taken in excess, previous to the resale of the land. Blunders of this kind are too easily avoided to be permitted to occur.

Both in the case of excess condemnation and in assessments, a question of importance is the extent to which the systems should be carried. It will be obvious that assessments may properly cover a much larger area than condemnation proceedings and that a more equitable distribution of cost will be had.

The apportionment of assessments depends also on the nature of the improvements. Thus an improvement purely local in character may properly be wholly assessed against the abutting property, while those of more general character should be more generally assessed.

In a paper before the Fourth Conference on City Planning, 1912, Nelson P. Lewis, chief engineer of the Board of Estimate and Apportionment of New York City, discussed the subject of assessing the cost of improvements, especially street opening and widening.

"We must determine to what extent the benefit will be strictly local, in what degree it will extend to a larger tributary area, and again, how much it will mean to the entire city or metropolitan district. In the case of residential streets, the purpose of which is to give light, air and access to the developments located upon them, the benefit will be entirely local, and the entire cost can properly be imposed upon the abutting property. When a highway is given a more generous width in the expectation that it will be called upon to accommodate a certain amount of through traffic, the benefit is more extended and the assessment in such a case may be prolonged to a line midway between it and and the next street of more than residential width. The major part of the cost, however, should be confined to the abutting property, so that the cost to it should be somewhat more than that of the narrower streets. In the case of arterial thoroughfares, or in that of the first street to be opened through an undeveloped territory, the effect of which will be to give access to and to stimulate the development of a large area, the district of benefit will be correspondingly enlarged. Again, in the case of thoroughfares of exceptional width, which it is proposed to treat as boulevards, the entire city or metropolitan district will be substantially benefited and should bear a proportion of the expense. In fact, the State itself may derive an advantage which would justify its assumption of a portion of the cost, but the disposition to recognize such an obligation on the part of the Commonwealth is exceedingly rare, even though a great city within

its limits may, through its large taxable values, contribute the larger part of the State's revenues by which its rural highway system is maintained.

"In the case of parks, this same principle might be applied. Some small parks are of strictly local benefit, and their cost could properly be placed upon the district in which they are located.

"In the case of street widening or the cutting through of new streets, the local advantage is less marked, though it will always follow. The mere fact that a widening or extension is required to accommodate traffic is conclusive evidence that the street has assumed more than local importance. The width of the roadway as widened is not an index of its local or general importance. There may be cases where the opening of a new street of a width commonly given to local streets and extending for a very short distance would, on account of its strategic position, be of very great general and of little local benefit.

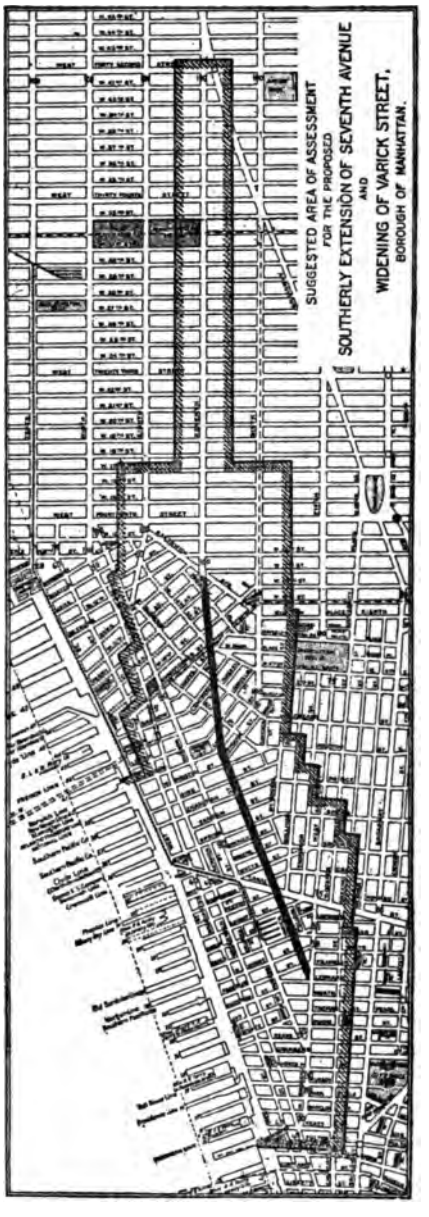


FIG. 73.

"It is quite apparent that the relative local, district or general benefit of any street or other improvement can be determined neither by its dimensions nor its cost. An improvement involving an expenditure of $1,000,000 in one part of the city may be more distinctly local in its bene-

ficial effect than one costing $50,000 in another section. No fixed rule can be established to govern the distribution of expense. It must be determined in each case after a painstaking investigation. Such investigation should not be entrusted to a different individual, board or commission in each case. There should be a permanent body which should act in all cases. This body should not be large, and it should be so constituted that its entire personnel could not be changed at once, thus insuring continuity and consistency of policy. They should be broad men whose training should have fitted them for their difficult and delicate duties. The misleading evidence commonly called expert testimony as to existing and prospective values will be of little value to them. They should be capable by experience and intelligence of forming their own conclusions."

An interesting example of an assessment area is that proposed for the extension of Seventh Avenue, in New York City, through to Varick Street, the widening of Varick Street and the further extension to Leonard Street and West Broadway, about a mile and a quarter.

A large assessment zone surrounds the proposed improvement itself, three-eighths of a mile on either side and half a block deep, (300 feet) on each side of Seventh Avenue to 42d Street, almost two miles above the upper terminus of the improvement.

The abrupt demonstrations of the assessment zone would seem to be far from equitable unless a carefully graded rate is imposed on different parts of the zone. The problem is comparatively simple as regards the abutting property, but the proper assessment of neighboring and distant parcels is likely to be unfairly carried out.

For this reason it would probably be desirable in many cases to subject the abutting property to excess condemnation and the outlying parcels to assessments.

The extension of the system of excess condemnation by the legislatures of the various states will undoubtedly occur from time to time, as the system is one of great advantage

under certain circumstances where a city controls its own development and can acquire park sites and land for other purposes many years in advance of its actual utilization. The land can be had at a slight expense by this procedure.

CHAPTER XXI

THE PLANNING OF GROWING TOWNS

Planning Towns at the Outset; Cost of Town Planning; Necessity of Expert Knowledge; Principal Factors in Town Planning; Town Sites; Civic Improvement Associations

THE one thing of all things which prevents cities from being properly planned is lack of civic imagination. The citizens of a small town never imagine that their town will become a large city. They may individually at times dream of a great city spreading out around the nucleus in which they live and they very frequently boast of the progress of the town during the previous decade, but the time when their town is to be a great city seems so far distant that as a whole they do not imagine that it will ever occur. The few enthusiastic souls who individually believe it are patronized or laughed at and the citizens as a body do not have the assurance to walk out into unoccupied fields and lay out sites for parks, squares, centers, libraries and monuments which may possibly come into existence a century later, or possibly never. It is too chimerical to be considered, and indeed in towns of even large size it may be that not a soul is aware of the benefits which it is within the power of the present generation to bestow on posterity, benefits so great that city planning is a civic duty demanding adequate and prompt performance.

Time quickly slips by and the sites for great improvements which once might have been laid out and reserved, the convenient plans which only needed to be committed to paper, become impossible save at enormous and prohibitive expense. It thus happens that many cities have plans originally determined by the fancy of the homewardly meandering cow, and great volumes of traffic must indef-

NAPLES, ITALY, VESUVIUS IN THE DISTANCE
An entire city in a color scheme of white

WORKINGMEN'S COLONY, ALFREDSHOF
Prototype of English garden cities

nitely follow the paths thus marked out unless expensive changes be made.

America is bound to grow vastly in the next century and the village of to-day to become the metropolis of the future. Yet few if any of such towns have plans as yet laid out and many a patient cow is still contributing her humble share to the city planning of the future while worthy citizens are less usefully employed.

The only American cities which have good plans are those which were laid out on the virgin soil a century ago, namely Washington and Buffalo, but it took imagination to lay them out, to design their plans to accommodate the needs of our own time in those early days when even the most enthusiastic could not have foreseen the great developments which have occurred. We now believe that we can look forward to and form a reasonably accurate estimate of the cities of the future, but it is questionable whether we can forecast progress any more surely than did our forefathers of a century ago. It, therefore, follows that every town of whatever size owes to its future the laying out of a suitable plan now at a time when it can be done at small expense and on a free field.

The cost of laying out the plan of a city while the city is still small is so insignificant compared with the benefits to be derived that it should not enter into consideration. The cost of such a plan is the best possible investment that a city can make, not only in the saving of future expense, but for its sentimental value, for when the future of a city is planned, that of itself supplies an incentive to growth as there is something definite to be accomplished, and the town is more likely to increase in size and importance through having such a plan than where its growth is purely at haphazard. At the same time, its enterprising citizens are more likely to remain and help build up the town than to go to larger cities, while besides retaining its own population, it draws from less enterprising cities and its growth is accordingly still further stimulated.

A small city in laying out the plan for future growth

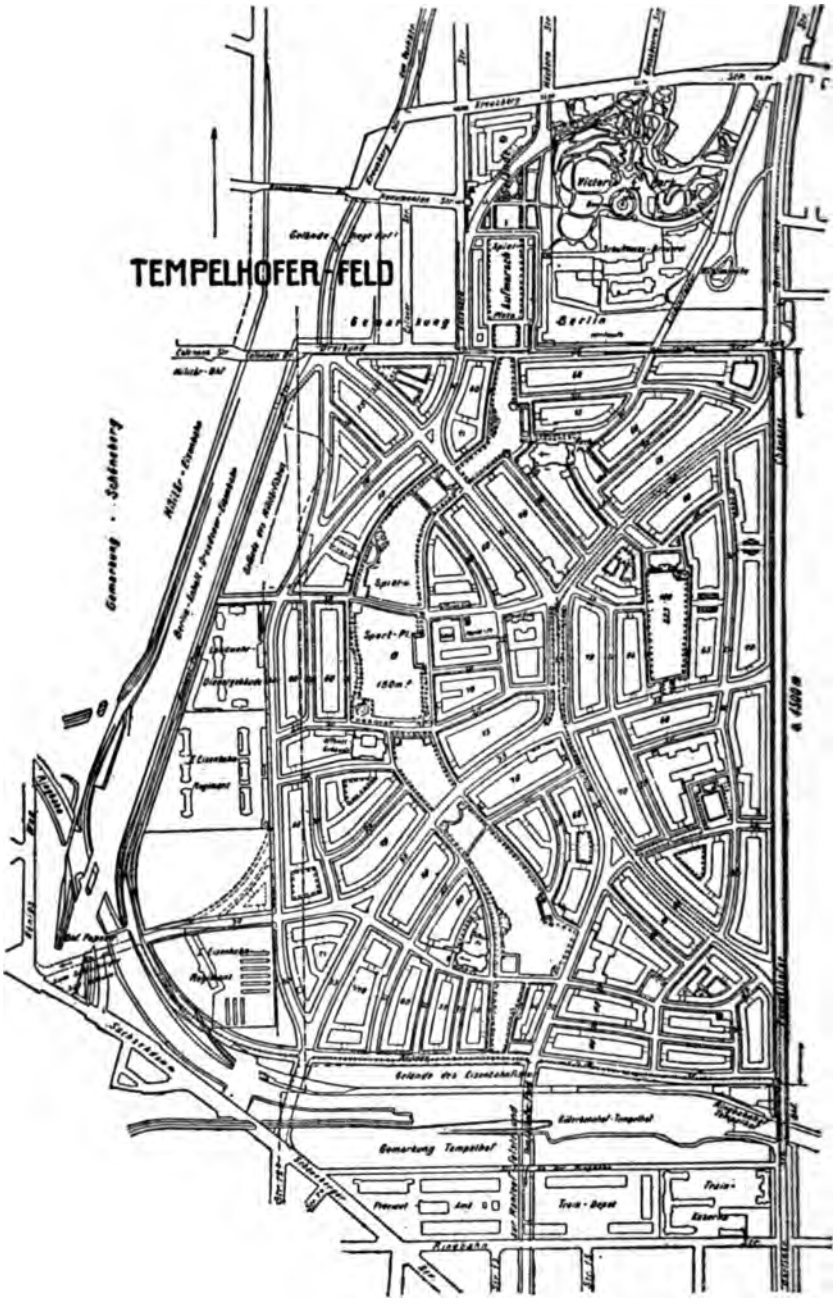


FIG. 74. PROPOSED GREAT GROUND PLAN OF TEMPELHOFER-FELD, A PART OF GREATER BERLIN

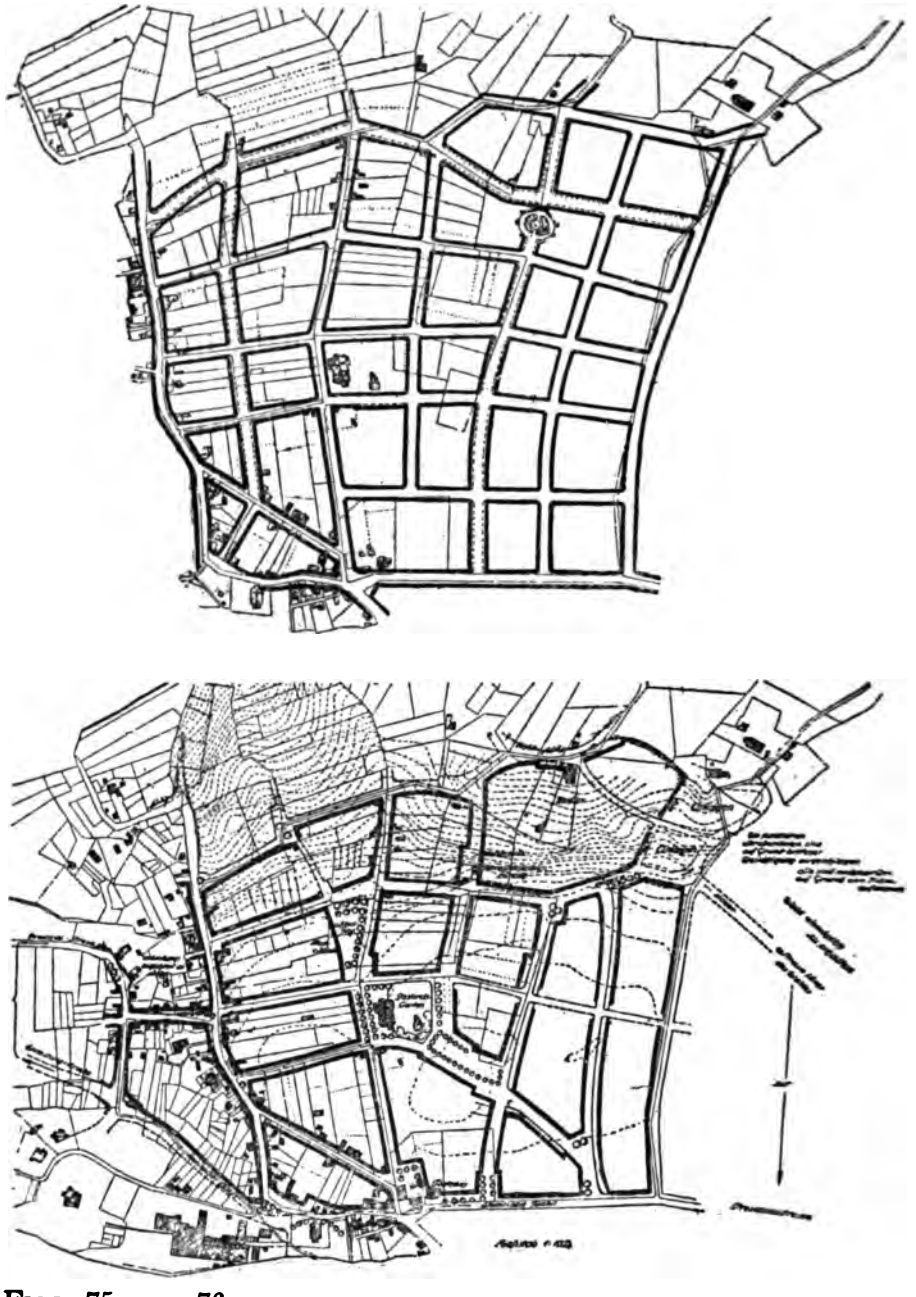
The intentional irregularity of the plan produces variety in the appearance of the streets

should proceed with caution and discrimination, and should obtain the best and most experienced civic engineering talent for the purpose. The existing large cities can only now be replanned so that in them the civic engineer does not have much opportunity for utilizing his talent, while at the same time the great property interests involved will oppose any wrong developments. In the small city where the civic engineer has a free hand although his opportunities are great, the possibilities of improper planning are also great, as there is no effective check against the mistakes which may arise from too much liberty of action on his part. The small town needs, therefore, to be just as careful as the larger town in the selection of the designer of its plans, and needs to give the same attention to the subject that it would if the millions of property which will ultimately be affected were already at hazard.

The small town should begin at an early period to accustom itself to proper regulations of different kinds, as only by suitable regulation may the plans once adopted be carried out, while if habits of regulation are once established the growth of the town will be stimulated and the welfare of its citizens variously promoted and no hardships felt in developing along the lines laid out.

It has sometimes happened in America that towns have been laid out along certain lines, but have grown off at one side in a manner not intended by their designers, and such towns are often cited as examples of the futility of attempting to forecast the future of civic developments. City planning has accordingly been more or less discredited and the tendency has been to permit growth in whatever way might best suit the private interests of the citizens.

The absurdity of laying out a plan and then expecting a city to develop along such lines of its own accord, and when it does not the added absurdity of pointing out its failure to do so as an argument against city planning, is an adding of insult to injury. It would be as sensible to erect a grape arbor and expect the vines to follow it without ties as to expect a city to follow its plan without the ties of suitable



FIGS. 75 AND 76. TWO GREAT GROUND PLANS OF CITY EXTENSIONS

The lower is much preferable since the mileage is smaller, rendering first cost and maintenance charges less, while greater variety and beauty of city pictures and increased convenience results

regulations. Indeed such regulations are an absolute necessity in training a city's growth; they are to the growing city what discipline is to the growing schoolboy, and just as indispensable in the formation of the character and habits of the city as discipline is in the formation of the character of the boy.

Suitable regulations are an integral part of a town's régime; and coincidentally with the laying out of its plans, the regulations which are to carry it into effect should be formulated and put into operation. Such regulations should be established by the designer of the town's plan, and carried out by the authorities as a permanent feature of the town's operation, for only in this way can the benefits of town planning be realized.

As the number of experienced civic engineers is necessarily limited it will be obvious that only rarely will a small town have among its citizens a capable civic engineer, and it will therefore, in practically all cases, be necessary to have the work performed by an expert called to the town for the purpose. The citizens of a small town should not under any circumstances attempt to lay out a plan without such expert counsel, for their unfamiliarity with the subject cannot fail to lead to expensive though well-meant mistakes.

The experienced civic engineer, knowing conditions both at home and abroad, being familiar with the latest developments and with the mistakes made and the successes achieved, can accomplish the desired results without any waste of effort or liability to mistakes.

He has the further advantage of being able to treat the subject on its own merits, for having no property or other interests in the city he has no personal incentives to bend the plan to his own advantage, as is likely to be the case if the plan is formulated by those having local interests to be protected or advanced. In addition to these reasons in favor of the outside expert, he has at stake his own professional reputation, which impels him to do his best work as otherwise a poor example of town planning would injure

his standing and operate against him in obtaining new civic clients.

The work of town planning involves so many and such intricate features that it is undesirable, especially, to entrust it to local civil or municipal engineers, for, however much experience they may have in their own lines, they will be lacking in the special knowledge which is necessary to make a success of city planning. Although the laying out of the ground plan is highly important, there must also be considered the problem of lighting, traffic, sewage, and sewage disposal, gas and water supply, police and fire alarm systems, waterways, harbors, railroad terminals, and other transportation facilities and the other numerous and complex features which are indispensable to a well-ordered city plan. In no undertaking, indeed, are the services of the expert more essential than in the planning of a city and nowhere does technical experience prove more profitable.

In the laying out of the plan of a small city, the principal factors to be considered are the location, the configuration of the land on which the city is to be built and the kinds of activity which are likely to characterize the city in the future.

The sites of many towns are selected in the knowledge that a place of importance is to be founded and in such instances, as was the case with Washington and Buffalo and more recently with Gary, Ind., and other towns comprehensive plans were adopted and the city placed in the most advantageous location. Most towns, however, have their sites selected by accident by some early settler, though many are located by real estate promoters. The sites of numerous cities of the future are of course as yet unoccupied fields, so that it would be desirable for each state or territorial government to establish a civic commission which should have such supervising powers as would enable it to locate sites for new cities in the most desirable places and to discourage the starting of cities at such locations as would not be best suited to public policy.

Towns which have arisen on sites selected by accident

must in most cases make the best of their locations, though by proper regulation their growth may be stimulated in certain directions so that disadvantages of site may be partially overcome, and wherever possible such a course should naturally be followed. The services of an experienced city designer are especially useful to such a town.

The site of a town having been fixed, whether by accident or design, the configuration of the land must be considered in order that the movements of traffic may en-

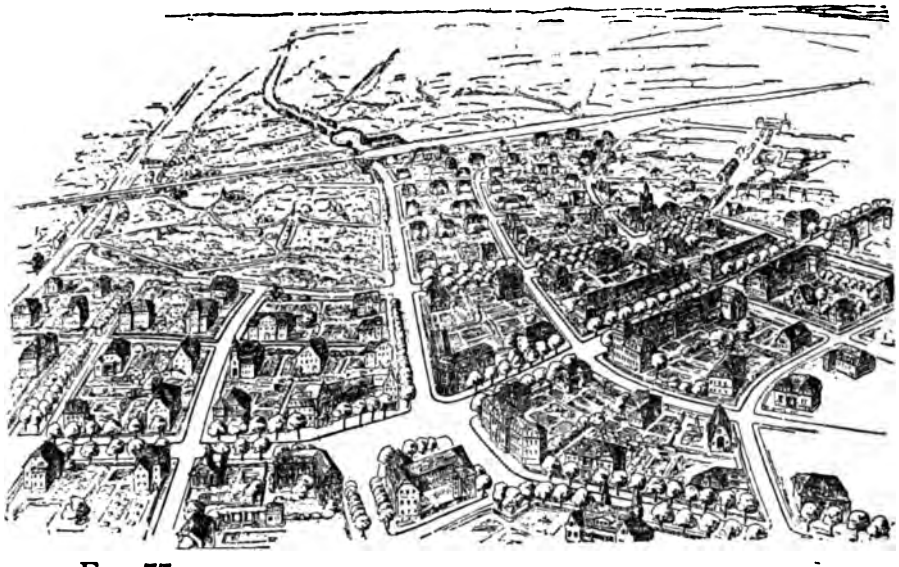


FIG. 77. PROPOSED EXTENSION AND SUBURBAN COLONY AT AHRENSFELDE, BERLIN

counter the smallest possible resistance. On a level plain the town may be planned freely, but if the site be hilly or on a river or with other natural features the plan must be so adapted that they will not prove detrimental. Such features may indeed often be utilized to enhance not only the general effect of the town, in æsthetic sense, but also to improve its traffic facilities and to increase its commercial possibilities. Various other factors must be considered, such for example as in the laying out of a manufacturing center, the prevailing winds, its location being such that smoke and gases are carried away from the remainder of the city.

A multiplicity of details thus enter into the design of a city and none of them must be neglected.

The purposes for which a town is planned also greatly affect its design, as a wide diversity of uses is apparent. Towns may be variously classified as maritime, manufacturing, commercial, administrative and educational, and a town which is destined to be a seaport of importance should, of course, be planned along different lines from the town which is to be a manufacturing center, while the commercial town, which is a place of barter and exchange, requires a very different layout from the town which is the capital of a state or the college town which is the seat of learning but which is to have no other activity of moment.

Whatever the uses to which the town is to be put, its design should always be well worked out from an engineering standpoint, and when this is done, the small town proves more healthful and desirable as a place of business and residence than the large city. Skyscrapers not being permitted, business is less congested and offices are lighter and placed to better advantage, while for residential purposes there is room for detached houses and lawns and air and light are pure and abundant.

The small city, however, which grows up without a plan and without engineering improvements possesses no such advantages, and lack especially of proper sanitary engineering may make it actually dangerous as a place of residence, while æsthetically it is likely to be as ugly on a small scale as the big town is on a large scale.

It is obvious, therefore, that every small town should have a well-considered plan, and that little by little, as it expands, its growth should be along the lines laid out, as it will thus accomplish the greatest results with the least expenditure of civic effort and its growth will be stimulated rather than obstructed.

It is not a matter of much difficulty or of great expense for the small town to provide itself with a suitable plan. A little initiative on the part of a few prominent citizens in bringing the subject before the public, a discussion of it

in the papers, and in meetings held for the purpose, the organization of a civic improvement association, and the appropriation of a small sum by the town or its donation by public-spirited citizens and the engagement of a qualified civic engineer will place the town on the path of progress and determine its growth in the most advantageous manner.

The starting of such a movement is nothing less than a public duty, and one which proves pleasant and profitable both in initiation and performance.

APPENDIX A

CO-OPERATION OF ENGINEER AND ARCHITECT IN CITY PLANNING[1]

THE present is a time of renaissance in the art of city planning and in future epochs it will be noted as marking the greatest advances in the art that have ever been made. Indeed, modern city planning is not only a renaissance but almost entirely a new birth of the art, for so many new elements and conditions enter into consideration that the city planning of to-day is a different thing from the city planning of previous centuries.

Consider for example the problems of a Roman city planner of the time of the Caesars, and those to be met by the city planner of a modern city. There is in a general way the same aesthetic problem to be solved, but even this is profoundly modified by modern conditions, while in other respects entirely new conditions are confronted.

The Roman city planner did not have to give any thought to railways or the enormous vehicular traffic of our city streets: automobiles and electric street cars to him were unknown and gas and electric mains had not been thought of. Street lighting did not concern him and docks for 1000 feet steamers were still far in the future. Skyscrapers housing from 4000 to 10,000 people and 750 feet in height were undreamed of and elevated and subway traction systems hundreds of miles in length gave him no concern. His problems were, comparatively speaking, simple and it was quite unnecessary for him to have at his command the great technical resources which must be brought into service to-day for the successful planning of a city.

The great changes which have come about are the result largely of modern scientific improvements, and the indispensable man to-day in city planning is the man who understands how such improvements are to be utilized to the best advantage to make of the modern city an efficient example of what it has become, a great operative mechanism for the concentration of population with its consequent economies, and increased conveniences and comforts.

---

[1] Author's address delivered before the International Congress on City Planning and City Maintainence, at Ghent, Belgium, 1913.

As practically all of our modern improvements affecting the city are of an engineering nature, the part of the engineer in city planning — the only person who is capable of utilizing modern improvements — is consequently of co-equal importance with that of the architect, a fact, however, which is not recognized by the public and but scantily by the professions of architecture and engineering.

The engineer to-day occupies a commanding position in city planning. He is the leader and the innovator. The aesthetic principles of city planning were determined in early ages and the architect can only work within the limits of those principles. His opportunities, however, are multiplied and new problems originated for him by the engineer, whose modern constructions in steel, iron and concrete the architect must embellish with his art.

The architect does not, by any advance of his art, give the engineer new opportunities, and call forth new engineering efforts, but it is the engineer with his advances who calls upon the architect to follow and render his structures pleasing with the art whose principles are ages old.

To this extent, the architect has new aesthetic problems to meet, so that the practice of the ancients avails him only in the most general way. The elevator, for example, made possible very tall buildings even before the day of steel structures and with such buildings, the modern architect is called upon to deal. The Roman architect had to consult the inclinations of the tenants and so made his upper stories with low ceilings, even to the point where the needy poet could not stand erect in his top floor room. Conditions thus affect aesthetic treatment and the height of modern buildings is, of course, only an example of the many changes which demand a new aesthetic technique. It is the duty of the architect to keep abreast of the times and to meet new things in a new spirit. New wine requires new bottles, and to achieve the proper results, the architect should embody in his structures the spirit of the age instead of leaving it to express itself in spite of his treatment.

The skyscraper and the reinforced concrete structures, particularly bridges, will express, as long as they exist, the fact that they are the product of the age of scientific progress, just as the Gothic Churches bear testimony to a religious spirit and feudal castles evidence the then existing organization of society. In order to recognize and translate our conditions into the permanancy of architectural forms, the architect should co-operate with the engineer to the fullest degree and should not attempt any important work without adequate engineering collaboration, as otherwise failure is certain to result. The architect may, of course, be himself an engineer, or the engineer may be an architect, but architecture and engineer-

ELECTRIC OPERATED STATIONARY SLEWING-CRANE
Fifty tons capacity, hoisting a passenger car, Antwerp

ELECTRIC OPERATED LIFT-BRIDGE
Well-designed bridge at the harbor in Duisburg-Ruhrort

ELEVATED RAILWAY ALONG THE LANDWEHR CANAL, BERLIN

Owing to narrowness of street this elevated structure is built along the canal bank. The artistic and well-kept condition of elevated structure, canal, etc., increases its attractiveness

ing are both subjects of such magnitude and call for such different talents that success is not likely to be achieved in both fields by a single individual. The architect and the public must awake to the fact that the engineer has an enormously large and ever increasing part in the scheme of modern life, and that in city planning, he occupies an indispensable position, in fact, a successful city could be constructed by the engineer alone, while the architect alone would make a lamentable failure were he without engineering qualifications.

The modern city may be considered in a sense as a large manufacturing plant, in which the individual industries are related parts, and in the laying out of the city this conception should be the governing factor. The city provides its inhabitants with a ready means of communication with each other, ready means of exchange and transportation of products, and storage and living quarters, all of which are steps in the transformation of material from raw to finished stages. The city is in fact a great factory.

Accordingly in the building of a city, its site should be selected and its parts so placed in relation to each other that a result of unity will be obtained, all its components being proportioned to each other in such a manner as to enable its various operations and the activities of its citizens to be carried out with the greatest economy of effort and the greatest degree of efficiency.

The various civic activities which must be taken thus into consideration and provided with economical and efficient instrumentalities, include of course not only manufacturing industries but all the processes of the civic body, such as trade, banking, schooling, recreation and the like, for it is quite as necessary that school houses be placed in positions of advantage, so that the benefits of education may be acquired at the least physical inconvenience, as it is for factories to be well placed for obtaining raw materials, while adequate and accessible recreation grounds are quite as important as terminal facilities.

Co-ordination of these various elements of civic construction is another fundamental help in city planning. While every element must be taken into consideration, there should be no excessive devotion to any one. Terminal facilities and manufacturing sites thus while they must not be allowed to crowd out parks, should not, on the other hand, be sacrificed to make room for unnecessary playgrounds. Throughout there should be the proper sense of proportion, and the adjustment of means to ends which is necessary to the successful carrying out of the numerous activities of the city.

The aesthetic appearance of the city depends upon the genius of the architect and landscape designer, but in the innumerable

practical problems of the city as an operative mechanism, the genius of the engineer is equally demanded. The architect and the engineer should thus work together in the planning of a city, and be in constant and well considered consultation, to the end that the artistic design may be adapted to practical necessities, and practical requirements modified for the benefit of aesthetic results.

As practically all the modern cities are dependent on heir manufacturing industries, in the planning of a city their proper location is accordingly paramount. In the laying out of a new city, the selection of a suitable site will solve most of the important problems but as cities on virgin sites are but seldom called into existence, and as consequently the greater part of city planning is concerned with the laying out of additions to old cities and rebuilding of built up sections, the location of factories must be carried out with regard to existing condition, rather than in what might be the most ideal manner on a clear site. Numerous questions will enter into consideration among the most important being transportation facilities, accessibility to workers, and the sources of power and degree of nuisance created by the operations of the factory itself. Thus in a small city in which fine woodwork is the principal industry, and in which electrically transmitted power is available, the factories may be located with little regard to the element of nuisance, as noises and the transportation of materials will be the only nuisances, but in a large city where the principal industries are foundries, smelting works and iron manufacturing and where coal is used, the laying out of the factory districts must take into consideration expenses of transportation of raw and finished materials, cost of land, accessibility and the question of nuisance, and in the case of chemical works, dangerous nuisance, such as the filling of the air with noxious fumes and the fouling of streams with waste products. Under such circumstances, the prevailing direction of the winds will often be an important factor while drainage and the location of workingmen's homes must also be considered.

In problems of this kind, it is obvious that the landscape designer and the architect will be at a disadvantage and that the engineer with his technical experience will be best fitted to deal with the conditions. Any attempt therefore to lay out a city without the cooperation of the engineer must result in undesirable conditions, which will become magnified and irremediable with the growth of the city.

Practically all cities are constantly paying in inconvenience, delay and congestion for the neglect of their founders to properly lay out their plans. In the United States, of all its large cities, Washington and Buffalo are alone in having been planned to meet

the requirements of the traffic which has now developed. Most American cities suffer from congestion which cannot be remedied except at great expense and cities comparatively small in size but which are growing rapidly and which will in the nature of the case become large cities in the future are neglecting golden opportunities to lay out proper plans now while it is still possible at little cost.

When, however, a city has grown to large size and traffic too great for its streets, as they exist, has developed, it becomes necessary either to widen the streets, cut through new ones or adopt some special form of construction to increase the traffic carrying capacity of the streets.

Such special forms of construction include subways, elevated roads, service tunnels, freight subways and underground streets. Structures of this kind, while of a purely engineering character, should nevertheless not be constructed by the engineer without the assistance of an architect as a co-operator.

Commonly the engineer proceeds with such works, having in view only the utilitarian objects to be achieved. He does not hesitate to fill a street with an elevated structure utterly devoid of any aesthetic quality, while entrances to subways are usually inartistic and the stations of such roads seldom have anything more to recommend them than a little glazed tiling.

The keeping of a street as clear as possible is one of the first principles of civic aesthetics, and no auxiliary structure of any kind should be erected except under circumstances of the greatest necessity. When it must be built, however, no pains should be spared to make it as pleasing an addition as possible to the ensemble of the street, and the engineer should not be permitted to proceed with it until it has the sanction of some competent aesthetic authority. Unless the engineer has the requisite architectural skill, which is seldom the case, he should invariably retain an architect familiar with the proper treatment of such structures, as otherwise a displeasing if not an offensive encumbrance will be added to the street.

Streets should not only be kept clear of permanent structures, but they should not be continually torn up for temporary purposes. As a means of obviating such disfigurements, service tunnels are highly desirable and are proving their value in a number of cities. Containing as they do electric wiring, piping for gas, water, and pneumatic tubes of all kinds as well as means of access to the sewer beneath, there remains no excuse whatever for the endless tearing up of streets which is such a frequent nuisance in streets not so constructed.

A city may be said to have two individualities, or to produce two impressions: that created by its appearance during the day

and that by its appearance at night. The latter is likely to be the more picturesque, and it is not infrequently the impression by which the city is best known, for the time has long since gone by when the night effect may be disregarded, as often the finest effects of buildings and sections are those produced under illumination. It is thus the duty of a city to give the most thorough consideration to the question of lighting and to have its lighting system planned with as much care and attention as is devoted to any other phase of its design.

Lighting should be carried out by the lighting engineer, a specialist who in addition to being an engineer, is also an artist, capable of arranging the illumination to the best advantage.

Many American cities have of late years adopted the practice of lighting streets by so-called tungsteliers made up of from three to five tungsten lamps, on low posts, thirteen to fifteen feet above ground, while the posts are spaced from thirty to sixty feet apart. The high power arc lamps hung at a high elevation, as in European practice, produce much finer artistic effects as well as being much more economical.

Among the basic and fundamental functions of a city, there is none of greater importance than that of water supply. However beautiful and attractive a city may be made, if it runs a befouled and death dealing fluid through its watermains, it is but a whitened sepulchre and a mockery. Murder by wholesale is the result, and a list of victims which would fill many volumes could be compiled of those who have died from diseases arising out of the negligence of the cities in which they were compelled to live; if indeed the supplying of diluted filth instead of water may be termed negligence.

No city without a water purifying system unless it has a source of naturally pure water can in reality have any claims to being considered a civilized place of residence, yet American cities while they spend millions on pumping plants, spend little for purification. An evidence of the fear in which the water of many American cities is held is shown by the numerous and highly prosperous so-called spring water companies, which sell water in 5 gallon bottles delivered to the consumer.

The amount of money spent by the individual members of the public of any large city for such water would undoubtedly suffice for a purification plant for the whole water supply of the city.

The water supply system of a city should be utilized in the design of the city to produce aesthetic effects, being particularly well-adapted for such purposes.

In many cities, water towers of a highly ornamental character may be erected, constructed of re-inforced concrete, steel or masonry, adding to the attractiveness of the city. Wherever possible such

towers should be erected instead of the unsightly steel towers or stand pipes so commonly put up.

Cities which draw their supply of water from distant water sheds may find it of advantage to conduct it through an aqueduct which when led across valleys offers great opportunities for effective architectural treatment. A surplus of water may be drawn from the water shed to be used at some selected point forming an artificial cascade and waterfalls, while a high road may be built on the aqueduct.

Where water is supplied from sources requiring pumping stations, these should be of well designed monumental character. In the city itself, as an architectural symbol of the water supply system, there should be erected monumental terminal fountains. These should be either in the form of geysers or cascades which are susceptible of a high degree of architectural ornamentation.

In Rome, the terminal fountains of Aqua Paola and the Fontana Trevi; and in Marseilles, the fountain of the Palais Long Champ are excellent examples while other cities abound in similar works in modern style.

A well known monumental water tower is that at Mannheim, Germany, in which the tower is utilized as an ornamental structure in the center of the city, surrounded by parking and fountains.

While city water supply systems are strictly engineering propositions, it will be seen that opportunity is afforded for utilizing the art of the architect and in addition that of the sculptor in symbolizing the city's possessions and the means of supplying its citizens with one of the most important of all the necessities of life: water.

Practically every large city in the world is a city of important waterways. Ordinarily viewed as an adjunct to a city's commerce, its waterways, however, will be found in almost every case, if not the chief reason for its existence, to be a factor of the first importance in its progress.

Cities which neglect their waterways fall behind in growth and prestige, and those that improve their harbor facilities forge ahead, in many instances, with wonderful strides.

The question of harbor improvements is thus one of the greatest importance, in connection with city planning, and it deserves the most careful consideration of those in authority and the support of all classes of citizens. Cities having great natural advantages must keep their equipment up-to-date, while cities with limited natural facilities may, by well designed improvements, lift themselves into positions of the first consequence, as many European cities have done in recent years, coming into successful competition with existing ports.

As the principal purpose of a harbor is to furnish a means of transference of freight between inland and seagoing carriers, the harbor which affords the cheapest and most expeditious means of transference will attract the greatest patronage, provided its location is not such as to be a handicap. Vessels do not seek so much a spacious harbor as they do one in which they may quickly discharge their cargoes and reload, at small expense, so that a city, by the erection of a breakwater, the dredging of a creek or river and the construction of modern docks laid with railroad tracks, permitting cars to be brought alongside the vessels, and fitted with the latest facilities and mechanisms for loading and unloading, will be in a more advantageous position than a city in which the natural harbor is better but in which modern systems have not been installed.

The commerce of a maritime city is composed of freight handled by inland carriers, such as railroads, river steamers, canal boats and other forms of transportation, and coastwise and overseas freight, and in addition, the products of its own factories.

The arriving freight is for four principal purposes; immediate transshipment, storage for later shipment, material for the city's manufactures, or goods for consumption in the city itself. The facilities of the city should, therefore, be planned so that the freight for each of such purposes is handled in a different manner. Freight intended for immediate transshipment from cars to vessels, or vice versa, should be handled in piers laid with railroad tracks, equipped with loading and unloading appliance so that the cargoes may be transferred with as little intervention of labor as possible, and with the greatest speed.

In addition to the engineering features of harbor improvements the general aesthetic effect of the docks and environs of a city should be such as to add rather than detract from its appearance, for cities which are sea ports offer large opportunities for the working out of interesting features, and the sea wall may be varied with parks, docks, terminals, gateways and the like.

Water approaches with sea gates or landing piers may often with advantage be made an integral part of a city's plan, with broad avenues or boulevards leading to the civic center or other terminal features of the city's plan.

Sea gates should be made of a monumental character, and sea walls and other structures should be of a permanent and well designed character. Piers facing streets should be in the proper architectural spirit and in construction should be of a fire proof nature. It is usually desirable to run boulevards parallel to the water fronts, with a narrow park along the whole front, thus providing a con-

ELECTRIC ELEVATED AND SUBWAY SYSTEM, BERLIN

Railway station with overhead crossings at the city park. In rear new City Hall

BRIDGE IN JAMES PARK, MADISON, N. J.

BRIDGE NEAR HAIGHT STREET ENTRANCE, GOLDEN GATE PARK
SAN FRANCISCO

Interesting examples of park bridges

venient place for recreation along the water, usually the most agreeable part of the city, but too often taken up for business purposes.

Recreation piers should also be built in sufficient numbers and reached through riverside parks. In many cases, however, cities have surrendered their riverside park sites to business purposes, the residential districts being driven back to the land districts.

Water fronts should be reserved for park purposes instead of being taken up for railroad tracks, storage yards and other accumulations, for since railroads haulage in cities is to-day largely by electric locomotives, the railroads, if they must run along the water front, may be put in tunnels which will leave space for parks.

Water front improvements thus offer almost unlimited opportunities to both the architect and engineer, although too often the work is handled by the engineer with no attempt whatever to embody any aesthetic features. The conspicuous position of water front improvements makes it especially desirable that they should be treated in such a way as to be an embellishment rather than a disfigurement of the civic entity.

Of even greater prominence in the city's ensemble, and consequently demanding most urgently the proper aesthetic treatment, are bridges. Nevertheless it has been the practice almost wholly in America to neglect this phase of bridge construction, with results of the most unfortunate character. Vast numbers of bridges exist which make no pretentions whatever to being anything but purely utilitarian structures.

This is particularly to be deplored when such bridges are the entrances to cities, for the whole artistic scheme of the city is unfavorably affected. No single part of the plan of a city, with the exception of the civic center, is of greater importance than its bridges.

The civic center may be likened to the main hallway of a building and the bridge to the portals. Often the first impression of a city and frequently most lasting one is gained from a bridge and as the entrance to the city it should be treated with the dignity it deserves, and be made a feature of the city's plan, rather than a mere encroachment of a utilitarian nature.

A bridge should be constructed, aesthetically, from three principal points of view; the bridge in itself, the bridge in its relation to its approaches, and the whole effect of the bridge and its approaches in relation to its environment.

In its design it should be regarded as an integral part of the city's plan and it should be located in reference to the whole plan of the city in such a way as to produce the most efficient and pleasing results. A bridge may for example serve as a terminal or focal of an

important avenue or for several converging avenues, full advantage thus being taken of its architectural importance.

Its location being determined the bridge itself should be of such a design as to meet in the most direct and practicable manner the conditions it will be called upon to fulfill, and its approaches should be of such a character as to enhance its value, rather than as is so often the case of such a character as to detract if not ruin its entire effect.

In order to achieve the proper results it is necessary for the engineer to co-operate with the architect in the design of the bridge and its approaches and with the city planner or civic architect in its relations to the plan of the city as a whole. Unless this is done bridges will be ugly, misplaced and ill suited to their purposes.

Numerous contributory causes, however, in addition to the lack of co-operation between engineer and architect go to furnish the inartistic effect so prevalent in American bridges, among which are absence of governmental supervision, necessity of keeping cost at the minimum, legal hindrances, haste in construction, undue competition and use of contractors' plans or of one set of standard plans for numbers of bridges, imitation of railroad bridges for other places and the absence of any well settled forms for the artistic treatment of iron construction.

The last named reason is one of considerable importance, since like skyscrapers, modern metal bridges are a recent structural form and there has not as yet been time nor talent enough given to the subject to develop a satisfactory architectural treatment. In this quarter, however, American designers have much to learn from European practice and examples, as the problem of bridges of artistic construction is being solved with splendid results.

In the aesthetic design of a bridge, it should be remembered that the bridge is a work of architectural art and that as such it should conform, in its own field, with the general principles of artistic design.

The first principle is that of unity. The bridge with its approaches should produce the impression of being a single homogeneous structure. It should also show appropriateness to its surroundings. It should be symmetrical, harmonious in proportion, simple, obvious in the relation of its structure to its purposes, economical in the use of material and embellished without overornamentation.

With the bridge itself constructed in accordance with such principles, its approaches should be treated in a similar spirit, and made to add to the dignity and effect of the bridge. A plaza suitably laid out is almost a necessity for a bridge of any size, while a suitable view of the bridge as it is approached is another.

The terminal plaza may even with good results be a park of some size, suitably laid out and embellished, and the bridge thus be given the benefit of a most favorable approach.

In the only civic feature of American cities which surpasses anything which the continent has to offer, the skyscraper, an example is seen of the excellent results of the co-operation of engineer and architect. It is practically the only instance in which, by the nature of the case, they have been forced to co-operate, and though the skyscraper is an infant among structural forms it has already reached a high degree of engineering and architectural development. Although only a single generation of architects has had the opportunity of dealing with the skyscraper problem excellent results have been obtained, and it is reasonable to suppose that as from time to time architectural geniuses arise, the architectural results will be greatly improved. The engineering problems of skyscrapers were solved in a few years and practically nothing remains to be done in that field.

The skyscraper, however, while successful as an individual structure, is a great failure in other respects.

Owing to its great cost it does not as a rule pay over four per cent on the investment and often not more than two per cent, yet though not a financial success it usually decreases the rental value of adjacent structures which are unable to compete in attractiveness and convenience with it.

It sets a high standard of office accommodation and business firms in order to maintain their prestige must occupy offices in the skyscrapers at an increased expense which brings no return. It is thus unprofitable to tenants, owners and neighbors.

In addition it creates street congestion and congestion of transportation, compels the larger part of its occupants to work in artificially lighted rooms, and to take long daily journeys to and from work. By concentrating business in one quarter it prevents the development of other sections of the city which remain filled with old and dilapidated structures.

The erection of skyscrapers has been considered by continental cities and official reports have been made on the results achieved in New York. Among the reports was one to which some prominence was given and it was unfavorable to skyscrapers for the reason of fire risks enhanced by the draughts of elevator shafts. This report, however, was in error, since the fire risk is almost negligible.

The skyscrapers are practically fireproof, since rooms have been burned out far above the street level without damage to adjoining rooms or to the structure as a whole. It is quite unlikely that

a modern skyscraper of the present type will ever be destroyed by fire, as the engineering features are so highly developed as to make this almost impossible. The principal real objections to skyscrapers have been stated, and there can be no question that they are an undesirable addition to a city.

The effect of engineering progress on the growth of modern cities is one of the marvels of the age. The cheapness, convenience and celerity of passenger and freight transportation and particularly of electric traction, has made possible a much vaster civic growth than could have taken place in former ages. Cities tend to grow to what may be termed the point of saturation, that is the desirability of residence in cities is so much appreciated that the population of a country gravitates to a city until the crowded conditions become so onerous as to automatically check further growth Rapid transit has in the last generation greatly raised the limit of saturation so that there appears now to be no reason why cities may not grow in size to ten or twenty millions before conditions will become such as to make residence in smaller places or in the country more attractive.

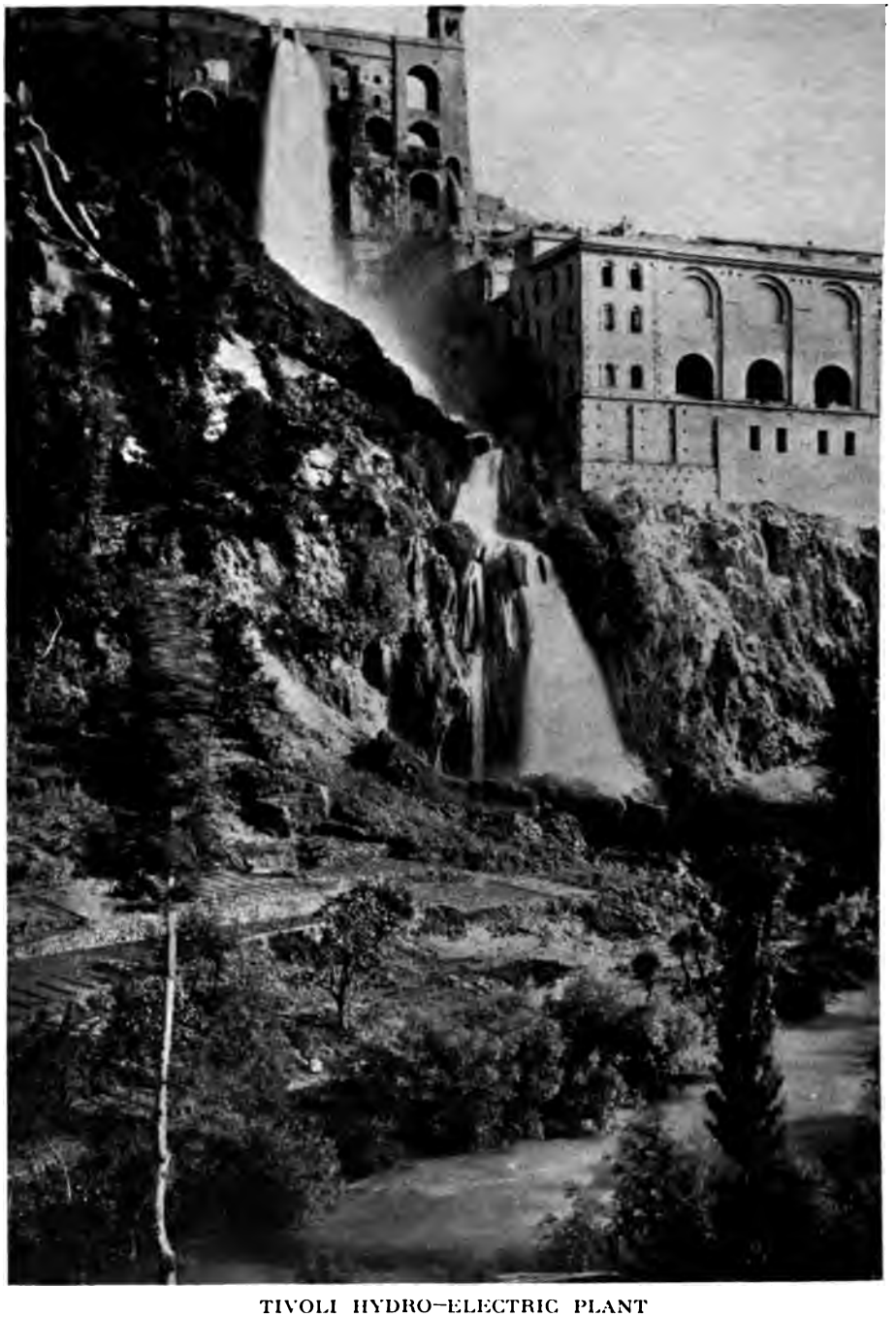
The principal factor which checks the growth of cities is the cost of living, for with increased population comes the necessity of increased expenditure for civic improvements. Thus New York is spending $300,000,000 for new subways, $200,000,000 for additional water supply and over $100,000,000 for docks, a total of over $600,000,000 for only three items. This means an interest charge, at four per cent, of $24,000,000, which amounts to $25 a year in taxation for a family of five, to say nothing of sinking fund charges, and this is in addition to the great burdens of taxation already borne for other expenses. New York even now contains only small industries and many of these are leaving the city, drawn away by more favorable conditions found elsewhere, a drift which will tend to make New York purely a commercial and financial center as these are activities which are transacted on a large scale in small quarters and with employees highly enough paid to find existence possible in the city.

Civic growth is thus automatically checked, but further, owing to legislative action a so-called debt limit has been fixed which prevents the city borrowing for its improvements more than a certain proportion of its assessed valuation. While this prevents ultimate bankruptcy, it also prevents the city from raising funds for many needed improvements and in turn causes stagnation of business, which is drawn away to cities capable of supplying the necessary facilities through being less heavily burdened by taxation.

A consideration of these various factors discloses the enormous

INTERIOR OF ELEVATED STATION, BERLIN

INTERIOR OF SUBWAY STATION, BERLIN



TIVOLI HYDRO–ELECTRIC PLANT

For supplying Rome with electric current. The artificial waterfall and apparently antique aqueduct constructed to attract visitors

influence which engineering is having upon society. It presents new problems not only to the architect, but to the financier and legislator as well and their utmost endeavors are necessary to so adjust conditions as to be able to take advantage of the great progress of engineering science.

APPENDIX B

THE EXECUTIVE MANAGEMENT OF A CITY

SUCCESS in city planning is proven by the subsequent results of city operation. Convenience, adequate transit facilities, proper distribution of traffic, avoidance of congestion and all the various factors entering into the operation and maintenance of a city are constantly demonstrating the value of the city's plan.

It follows that the city planner must be thoroughly familiar with all of the various results to be achieved by the city's plan and he must understand not only the artistic side of city planning but every detail of the operation and maintenance of the city in order that the plan may be a success economically as well as artistically.

A city, however, which has been successfully planned and has had its improvements put into operation by the city planner, must in order to take advantage of its facilities place its operation and maintenance under the supervision of a man or a body of men who understand and know how to utilize the work of the city planner.

Every principle and purpose of the plan must be known and every phase of its development understood, for the inadequate utilization of the city's plan is as bad as if the city planner had not planned the city suitably.

To secure proper administrative results is a difficult civic undertaking, but of recent years a system has been evolved which seems destined to revolutionize city administration and which promises to enable cities to obtain proper administrative results.

The system, that of commission government, has taken the place of the old aldermanic system in some 350 cities. Five commissioners are elected who have both legislative and executive powers and who have entire charge of the city's affairs. They are elected by the voters as a single body, the old division of wards being discontinued.

This form of government centering responsibility in five men is proving very efficient and promises to entirely supersede the old aldermanic method. A modification of it is now coming into practice since the five commissioners often develop friction which shows itself in the department of which they have charge. The new plan is the appointment by the commission of a city manager who is given complete executive authority under the control of the commissioners who sit as a legislative body.

The effect of this plan is practically that of business corporations, the city manager corresponding to the president of the corporation and the commission to the directors of the corporation.

Dayton, Ohio, is the first large city to put the plan in operation and the salary of the city manager is fixed by the commission at $12,500 per annum.

The important clauses in the Dayton city charter relating to the office of City Manager are as follows:

SEC. 47. The commission shall appoint a City Manager who shall be the administrative head of the municipal government and shall be responsible for the efficient administration of all departments. He shall be appointed without regard to his political beliefs and may or may not be a resident of the city of Dayton when appointed. He shall hold office at the will of the commission and shall be subject to recall as herein provided.

SEC. 48. Powers and duties of the City Manager. The powers and duties of the City Manager shall be:

(*a*) To see that the laws and ordinances are enforced.

(*b*) To appoint and, except as herein provided, remove all directors of departments and all subordinate officers and employees in the departments in both the classified and unclassified service; all appointments to be upon merit and fitness alone, and in the classified service all appointments and removals to be subject to the civil service provisions of this charter;

(*c*) To exercise control over all departments and divisions created herein or that may be hereafter created by the commission;

(*d*) To attend all meetings of the commission, with a right to take part in the discussion but having no vote;

(*e*) To recommend to the commission for adoption such measures as he may deem necessary or expedient;

(*f*) To keep the commission fully advised as to the financial condition and needs of the city; and

(*g*) To perform such other duties as may be prescribed by this charter or be required of him by ordinance or resolution of the commission.

SEC. 49. Salary. The City Manager shall receive such salary as shall be fixed by ordinance of the commission.

SEC. 50. Investigations by City Manager. The City Manager may without notice cause the affairs of any department or the conduct of any officer or employee to be examined. Any person or persons appointed by the City Manager to examine the affairs of any department or the conduct of any officer or employee shall have the same power to compel the attendance of witnesses and the production of books and papers and other evidence, and to cause witnesses to be punished for contempt, as is conferred upon the commission by this charter.

The adoption of the City-Manager plan by Dayton was made possible by recent constitutional amendments and legislative enactments which give all Ohio cities a large measure of municipal home rule, including the very important privilege of framing their own charters through an elected board and adopting or rejecting such charters by popular vote — all without recourse to the State legis-

lature. The Ohio statute under which Dayton or any other city may adopt the City-Manager plan reads as follows:

ARTICLE IV

SEC. 8. CITY MANAGER. The council shall appoint a City Manager who shall be the administrative head of the municipal government under the direction and supervision of the council and who shall hold office at the pleasure of the council.

SEC. 9. DUTIES CITY MANAGER. The duties of the City Manager shall be: (a) to see that the laws and ordinances are faithfully executed; (b) to attend all meetings of the council at which his attendance may be required by that body; (c) to recommend for adoption to the council such measures as he may deem necessary or expedient; (d) to appoint all officers and employees in the classified service of the municipality, subject to the provisions of this act, and of the civil service law; (e) to prepare and submit to the council such reports as may be required by that body, or as he may deem advisable to submit; (f) to keep the council fully advised of the financial condition of the municipality and its future needs; (g) to prepare and submit to the council a tentative budget for the next fiscal year; (h) and to perform such other duties as the council may determine by ordinance or resolution.

SEC. 10. SALARY OF CITY MANAGER. The City Manager shall receive such salary as may be fixed by the council; and before entering upon the duties of this office he shall take the official oath required by this act and shall execute a bond in favor of the municipality for the faithful performance of his duties in such sum as may be fixed by the council.

The city of Dayton proceeded wisely in the election of a city manager. Political considerations were ignored and an engineer was obtained, who was not even a resident of the city, and whose experience in engineering had fitted him to meet both the technical and executive problems of the city.

The plan of having a city manager under the direction of the commissioners is one of inherent merit since it eliminates jealousy between the members of the commission and relieves them of a great mass of detail and makes the commissionerships attractive to men of prominence, since they are not compelled to sacrifice their business interests in becoming commissioners, while the city manager is free from political influences that might affect the commissioners and can discharge the duties of his office as nearly without fear and favor as such a condition has ever been attained under any system of administration.

The city manager being a salaried man with no definite term of office must naturally give his best service to the city as the length of his term depends on his ability.

The city manager plan is just as desirable and applicable to the small town as to the large one, and the following quotations from a discussion of certain of its phases by the city manager of a town of 5000 are of interest.

"The preparation of the engineer-manager should consist in a thorough education along the lines of general engineering rather than

GRAND STAIRCASE LEADING TO THE STATUE OF ST. GELLÉRT, BUDA–PEST

GARDEN STAIRCASE, ROYAL PALACE, BUDA–PEST

FOUNTAIN OF NEPTUNE, FIRENZE

a knowledge of a few special branches. This will make it possible for him to advise and check up, in a general way, every act of the engineering department. He should also have an understanding of values and be able to estimate all classes of construction and maintenance work, be economical and able to establish systems of record-keeping and cost data and have a general conception of business methods and finances. In addition to this, he should possess an understanding of the city's sanitary and social conditions. These include street cleaning and garbage disposal, water supply, sanitary sewer system, drainage system, the working and living quarters of every class of people, the transportation facilities and numerous other items.

"The principal waste of city funds comes from lack of knowledge. This is most often conspicuous in the engineering department, and since the great majority of the city's business is of an engineering nature this makes up the greatest waste. This is positively true of towns which are believed to be too small to need an engineer the year around. Here lack of knowledge is the principal reason for receiving about 75c. value on every dollar spent in taxes.

"If a town or city had some means of figuring the money wasted in prospecting for lost underground systems, in the improvements buried and never found, in systems that are built with no idea of future growth and that have to be abandoned years before they are worn out, in the grading and regrading of streets, in sinking hundreds of dollars into permanent culverts and waterways built with no idea of future drainage and that have to be broken out when pavement is laid, it would be no difficult matter to prove the economy of city planning and of proper management.

"As soon as a town reaches a size which justifies permanent improvements, from that time on systematic methods should be carried out, and a capable man who is paid a fair salary and feels permanency in his position is more apt to be able to do these things than a council or commission.

"The employment of an engineer as manager no doubt will be considered too expensive, especially for a small town. The value of the records which it is possible to keep under this plan would more than meet objection. But there are several ways in which an income to the city's general fund can be realized by the newly created office: No matter how small the town, all sewer work, plumbing, wiring, water mains and services, meters, etc., should be inspected, and the small cost for doing this should be charged to the property owner. Then there will be the ordinary expenses of surveying lot-lines, giving lines and grades for buildings and sidewalks; these would be charged to the property owner and turned into the general fund. Also, there

will be the usual engineering for sewer and water extensions, curbs and pavements. And finally, if the manager has charge of the street work the street commissioner's salary may be saved the aggregate of these different amounts if the town were doing its share of improvement work, would be sufficient to employ a competent engineer without extra draft on the city's funds."

As it seems likely that numerous cities will adopt the city-manager plan, it may be well to point out the fact that such executives should be men competent to meet the problems of maintenance and operation which are very largely of an engineering nature. They should be fully experienced in all civic engineering undertakings and should have a thorough knowledge of what may be termed civic technique, that is, the best methods of operation and management and the results achieved in other cities both here and abroad in order to avoid waste and costly experiments.

Where the plan of commission government is not in effect the city council or mayor should retain as a consulting civic engineer a man of the qualifications noted, or where the city administration is not sufficiently progressive to do so, a private body such as the chamber of commerce or a merchants' association should retain such an expert in a consulting capacity, in order to be able to make suitable recommendations to the political administration of the city. This is particularly appropriate since such bodies represent the largest taxpayers and their participation is of more real consequence to the city than that of its political office-holders who have charge of its affairs without having its interests at heart.

INDEX

Abattoir, Dresden, 228
Advertising art, 159
Advertising column, 73, 81, 158
Administrative functions, 207
Æsthetic design of bridges, 100
Æsthetic principles in city planning, 29, 306
Aged, buildings for, 188
Ahrensfelde Colony, 307
Aldermen, 117
Alexander Bridge, Paris, 101
Alfredshof Colony, 189, 191, 294
Altendorf Colony, 189
Antwerp harbor, 306
Apportionment of assessments, 290
Aqua-Paola, 265
Architecture, American, 161; of large manufacturing buildings, 179; of large dry-goods store buildings, 179
Art commission, 26, 73
Art galleries, 202
Arterial highways, 55
Asphalt paving plants, 232
Assembly Center, Philadelphia, 146
Assembly squares, 122
Assessment of public utilities, 281
Assessments, 7th Ave., New York, 291, 292
Athletic field, 148
Avenue of Victory, Berlin, 134
Avenues, radial, 57
Auditorium, 147
Augustus Square, Leipzig, 126
Australia's capital, Carberra, 52
Automobile, calling system, 119

Balancing low buildings, 167
Barbarossa Plaza, Cologne, 85
Barracks in parks, 140
Baumeister, Reinhard, 3
Baumeister's principles, 49
Bavaria monument, Munich, 288
Berlin, Avenue of Victory, 134; Brandenburger Gate, 134; Bülow Street station, 115; City Park station, 312; city planning, 18; cost of re-planning, 64; electric light columns, 153; elevated railway, 113, 115, 277; Elevated railway station, 114, 316; Emperor Frederick's museum, 78; greater, 134; Landwehr canal, 307; new gateway, 157; Nollendorf plaza, station, 120; Oscar plaza, 202; parks and boulevards, 145; Schloss plaza, 282; Spree bridge, 101; steel arch bridge, 101; stone arch bridge, 101; street profile, 56, 57; suspension bridge, 101; Tanentgien street, 68; terminal approaches, 63; Unter den Linden, 159; volume of traffic, 112
Bismark monuments, 160
Blackwell tunnel, 118
Blocks for garden cities, 176
Block plan, 167, 181, 187
Bonn monument, 289; Rhine bridge, 100
Bonfires, 236
Boston, parks and boulevards, 144
Bourneville, 186
Brandenburger gate, Berlin, 134
Bremen harbor, 89; skyline, 168
Brick paving, 234
Bridges, 98
Bridge, Alexander, Paris, 101; approaches, 98; Lift, Duisburg — Rohrart, 306; steel arch, Berlin, 101; stone, Berlin, 101; Spree, Berlin, 101; suspension, Berlin, 101
Bridges, Roman, 99
Brix, Joseph, 60
Brooklyn Bridge, terminal, 110
Buda-Pest, garden staircase, 320; Statue St. Gellért, 320; Subway, 114; Subway Kiosk, 120
Buffalo, city plan, 51
Buildings for the aged, 188; tall, 171; balancing, 167; regulation, 169
Building companies, 199; façades, 160; regulation, 167, 172, 182
Bülow Street station, 113, 115

Burgplatz, Vienna, 34
Burg Theater, Vienna, 282
Business streets, 237
Bush Terminal, 94, 229

Canal, Landwehr, Berlin, 307
Candle power of gas lamps, 268
Canstadt, Wilhelma, 135
Cantilever bridge, 104
Carberra, Australia's capital, 52
Castle Square, Karlsruhe, 283
Cathedral, Cologne, 205
Cemeteries, 141, 212
Centers, civic, 20
Centers, regional, 30
Central Park, New York, 79, 133
Century Theater, New York, 204
Charles Gate, Munich, 68
Chelsea Docks, New York, 93
Chicago, great ground plan, 65
Chicago, waterways, 52
Children's school gardens, 220
Churches, location of, 203
City charter, 13
City construction, 230
City engineer, 117
"City fathers," 117
City Hall, Munich, 25
City Hall Plaza, Philadelphia, 52
City Hall Square, Wernigerode, *Frontispiece*
City Hall and Courts, St. Louis, 20
City maintenance, 230
City manager, 319
City planning movement, 2; what it is, 1; cost of, 12
City planner, 318
City re-planning, 11
City Theater, Frankfort, 204
Circumferential streets, 48
Civic Center, 20; Hirschberg, 33; Seattle, 28, 29; civic culture, 201; civic embellishment, 149; engineering, 6, 299; fountains, 265; features, 315; growth, 316; improvement, 11
Civilization, Roman, 2
Clock, municipal, 73, 81
Coburg with the Veste, 295
Cologne, Barbarossa Plaza, 85; skyline, 168; railway station, 107; Cathedral, 205; Rhine bridge, 100; replanning streets, 61; ground plan, 37
Color scheme for cities, 163, 165
Colosseum, 147
Columbus Circle, New York, 130
Columns, advertising, 73
Columbia University, New York, 28
Comfort station, Providence, 47
Comfort stations, 154
Communal industries, 217, 226
Commission on city planning, 18
Commission government, 318
Concert Salon, Gotenburg, 140
Concerts in parks, 142
Condemnation proceedings, 17
Congested street traffic, 124
Consumers' union, 194, 218
Co-operation of engineer and architect, 305
Cost of laying out a city, 12, 295
Cost of re-planning cities, 287
Court Garden and Allee, Düsseldorf, 141
Court of workingmen's houses, 174, 188
Cronenberg, 189
Curb stones, 70
Cypress Hill, Brooklyn, 212, Gate to Cemetery

Dahlhauser Heide, Colony, 190
Dayton, city manager, 319; city charter, 319
Delhi, India's Capital, 50
Density of population, Paris, 108
District system, 37
District heating system, 222
Docks, 89
Docks, Hamburg, 92, 94; State-owned, 96
Draining street railway rails, 247
Dresden, abattoir, 228; electric plant, 274; Zwinger, 34
Dry-good store buildings, 179
Düsseldorf, Court Garden and Alee, 141; river promenade, 153

Electric clocks, 81; generating plant, 271, 274; light columns, Berlin, 153
Electricity supply, 269
Electric street railways, 275
Electric traction, 106
Elevated railway station, Berlin, 114, 277
Ellicot, Joseph, 51
Embankment, Thames, London, 97
Emblems for comfort stations, 158
Engineer as city manager, 321
Engineering progress, 316

Engineering works, 163, 309
English workingmen's house, 196
European building regulation, 170
European cities, 32
Excess condemnation, 288, 289
Executive management of a city, 308

Fairy Fountain, Berlin, 221
Financing civic improvements, 287
Fire alarm system, 81, 212; department, 211; escapes, 179; hydrants, 73; losses, yearly, 214
Firenze, Neptune fountain, 321
Federal center, 24
Floating baths, 225
Flagg, Ernest, 161
Flatiron Building, New York, 46
Floral parks, 146
Forest Hill Garden, 187
Forum, Pompeii, 4, 27; Rome, 22
Fountain, Fairy, Berlin, 221
Fountain of Neptune, Firenze, 321
Fountain Paolina, Rome, 269
Fountain Trevi, Rome, 264
Frankfort, city theater, 204; gas works, 204; harbor, 88; Opera House, 204; palm garden, 140; railway stations, 107; water tower, 127
Franzens Ring, Vienna, 127
Freight terminals, 89
Friederich's Plaza, Frankfort, 127
Friedrichshof Colony, 191

Gaiety Theater, London, 69
Garbage by-products, 256; contractors, 256; destructor plant, 258; removal, 79
Garden cities, 180, 185, 195; Block for, 176
Garden city of Hellerau, 186
Garden City, Port Sunlight, 193
Gardens, municipal, 135
Garden staircase, Buda-Pest, 320
Garden suburb, 188
Gas illumination, 78; mains, 268; pressure, 268; retorts, 267; street lighting, 266; supply, 266; works, Frankfort, 274
Gate, Charles, Munich, 68
Gate to Cypress Hill Cemetery, Brooklyn, 212; to Greenwood Cemetery, Brooklyn, 212; of Victory, Munich, 12
Gateway, Berlin, 151; Sanssouci, Potsdam, 235
Genziner, Felix, 60
German cities, revenue from land, 197; height of buildings, 170
German fundamental principles, 44; city planning, 8; harbors, 92; police system, 209; consumers' union, 219
Gotenburg, Concert Salon, 140
Grand Central Station, New York, 106, 132
Grandstands, 146
Grand staircase to Statue St. Gellért, Buda-Pest, 320
Gramercy Park, 138
Granite block paving, 233
Grass plats, 185
Greater Berlin, 134
Great ground plan, 36
Great ground plan, Chicago, 65; Cologne, 37; Karlsruhe, 41; Seattle, 29; Mannheim, 40; Washington, 43
Great White Way, 26
Ground plan, 36
Ground plan of city Extension, 298
Ground plan, Tempelhofer Feld, 296
Group buildings, 188
Gutters, 70

Hall of Liberty, Regensburg, 288
Hamburg, docks, 92; skyline, 168
Harbor, Antwerp, 306; Baltimore, 96; Boston, 96; Buffalo, 96; Bremen, 89; Frankfort, 88, 90; Gate, 152; Glasgow, 92; Hamburg, 87, 89; improvements, 87, 312; Liverpool, 92; Manchester, 92; Mannheim, 95; Montreal, 88; Neuss, 88
Harbors, transferring passengers, 90
Hartford, Conn., 28
Haussmann, Baron, 3
Heavy trucks, 119
Heating value of gas, 267
Height of buildings, 168
Herrengasse, Rothenburg, 158
Highways, arterial, 55
Hirschberg, civic center, 33
Historical examples, 46
Hospitals, 206
Housing problem, Ulm, 197
Howe, Frederic C., 9, 197
Hydro-electric developments, 273
Hydro-electric plant, Tivoli, Rome, 317
Hydro-electric power commission, Ontario, 273

Illuminated monument, Berlin, 159
Incinerators, garbage, 257
India's Capital, Delhi, 50
Inland harbors, 88
Interstate Commerce Commission, 97
Isles, safety, 71, 238

Jamaica Bay, 93
Jungferstieg, Hamburg, 96
Justitz Palace, Munich, 20

Kansas City, parks and boulevards, 137
Karlsruhe, Castle Square, 283; ground plan, 41
Kiel, water front, 96
Kings Plaza, Berlin, 157
Königsberg, square, 21
Krupp, workingmen's colony, 189, 190
Kyffhäuser monument, 289

Lahn-Valley, 295
Lamp posts, 72, 75
Landwehr Canal, 113, 307
L'Enfant, 2, 8
Leipzig, Augustus Square, 126
Letchworth, 187
Leutzsch, water works, 256
Lewis, Nelson P., 290
Libraries, location, 202
Light posts, 74
Lindau, harbor gate, 152
Liverpool Garden Suburb, 188
Living rooms, 179
Lock Haven, children's school garden, 220
London, cost of re-planning, 64; Gaiety Theater, 69; Regent's Quadrant, 168; Rotherhithe tunnel, 118; Thames Embankment, 96; Trafalgar Square, 58; Traffic Commission, 58

Macadam streets, 234
Main arteries, 21
Maine Monument, New York, 213
Manhole covers, 71
Mannheim, ground plan, 40; harbor, 95
Manufacturing buildings, 179
Maritime city, 312
Market houses, 130
Market Plaza, Wiesbaden, 59
Market squares, 130
Markus Tower, Rothenburg, 5
Marquises, 75
Maximilian Street, Munich, 85
McAneny, George, 84
Metropolitan Opera House, New York, 25
Metropolitan Subway, Paris, 276
Modern cities, 307
Monuments, Bismark's, 160
Monument Emperor Wilhelm I, Bonn, 289; illuminated, Berlin, 159; Kyffhäuser, 289
Moving platforms, 115
Munich, Bavaria, 288; Gate of Victory, 12; general view, 169; Charles Gate, 68; City Hall, 35; Justitz Palace, 20; Maximilian Street, 85
Municipal, asphalt paving plant, 232; art commission, 26; baths, 222; buildings, 201; clocks, 73; refuse destructor plant, 258; abattoir, Dresden, 228; gardens, 135; ice plant, 221; markets, 218; power plants, 269; slaughter houses, 221

Names of streets, 74
Naming streets, 120
Naples, Italy, 294
National Maine Monument, 213
Neptune fountain, Firenze, 321
Neuss, harbor, 88
Newspaper stand, 73
New York Central Park, 79; Chelsea Docks, 93; comfort stations, 155; cutting of new street, 64; Flatiron Building, 46; free public baths, 223; Grand Central Station, 106; municipal asphalt plant, 232; Maine Monument, 213; Central Park terrace, 234; Pennsylvania station, 106; public library, 79; refuse disposal, 245; street widening, 84; terminal fountain, 266
Nolen, John, 60
Nollendorf Plaza station, Berlin, 120
Noisy vehicles, 210
Noted cities, 31

Obelisk, Central Park, New York, 164
Oil engine plants, 274
Ontario, hydro-electric power commission, 273
Opera House, Frankfort, 204
Open squares, 122
Oscar Plaza, Berlin, 202

Peking, water works, 258
Palm Garden, Frankfort, 140
Police signal system, 81
Police system, 208
Panama Canal, 97
Paper baskets, 79
Parks, barracks, 140
Parks of Berlin, 135, 145
Parks and boulevards, Boston, 144; Kansas City, 137
Park concerts, 142; entrance, 142; location, 136; restaurants, 145; small, 138; systems, 133
Paris, Alexander Bridge, 101; cost of replanning, 64; density of population, 108; Metropolitan Subway, 276; Place du Chatelet, 40; Rue de Rivoli, 40; St. Michel Fountain, 46; squares, 126; volume of traffic, 109; Vendôme Plaza, 203; Passenger per car mile, 115
Pennsylvania R. R. Station, 106
Philadelphia, assembly center, 146; City Hall Plaza, 52
Piers, 89, 91
Piazzetta, Venice, 152
Planning of growing towns, 294
Place de la Republique, Paris, 127
Place de la Nation, Paris, 126
Place du Chatelet, Paris, 40
Place Royale, Paris, 127
Plaza, Kings, Berlin, 157
Plaza del Popolo, Rome, 126
Plaza, Oscar, Berlin, 202
Plaza, Vendôme, Paris, 203
Playgrounds, 201
Police regulation, Berlin, 215
Pompeii, Street of Tombs, 4; Forum, 4, 27
Porta Nigra, Trier, 12
Port Sunlight, 180, 186, 188, 193
Port of Hamburg, 96
Posen, water works, 275
Post office building, 132
Potomac Electric Light and Power Co., 271
Promenades, 142
Providence, comfort station, 47
Public buildings, 131
Public library, New York, 28, 79, 132
Public interest, 12
Public ownership, 281
Public service corporations, 284
Public utilities, valuation of, 281
Radial streets, 48, 57
Rail drainage, 247
Railway stations, 106, 107
Railway, suspended, 279
Recreation grounds, 143
Recreation piers, 91, 313
Refuse can for street sweepings, 248; collecting cart, 248; destructor plant, 258; disposal, 254
Regent's Quadrant, London, 168
Regensburg, Hall of Liberty, 288
Regional centers, 30
Relief institutes, 208
Remscheid, strand bath, 225
Rent in colonies, 192
Re-planning cities, 11
Re-planning streets, Cologne, 61
Residential street, 175, 239
Restaurants in parks, 145
Revenues from municipal land, 135, 197
Rewards for artistic façades, 159
Rhine bridges, 100
River Promenade, Düsseldorf, 153
Riverside Drive, New York, 92
Roman bridges, 99
Roman civilization, 2
Roman city planner, 305
Rome, Forum, 22; Fountain Trevi, 264; Fountain Paolina, 269; Plaza del Popolo, 126; St. Peter's, 69
Rothenburg on the Tauber, 5, 158
Rotherhithe tunnel, 118
Royal Crescent at Bath, 168
Rue de Rivoli, Paris, 40

Safety isles, 71, 238
St. Louis, cost of cutting new streets, 64; swimming pool, 220; city hall and courts, 20
St. Michel Fountain, Paris, 46
St. Peter's, Rome, 69
St. Petersburg, water supply, 261
Sand sowers, 246
Sanssouci, gateway, 235; Sicilian Garden, 235; terrace, 135
Schoolhouses, stairways, 178
Schloss Plaza, Berlin, 282
Sea Bridge, Wilhelmina, Scheveningen, 147
Sea gates, 91, 312
Seattle, city charter, 13; civic center, 28, 29; great ground plan, 29
Seventh Avenue, New York, assessment, 291

Sewage pumping plants, 251; by-product, 245; disposal, 241; treatment plant, 243
Sewer pits, 70
Shade trees, 79
Sheffield, street railway system, 279
Show-cases, 72
Sicilian Garden, Sanssouci, Potsdam, 235
Sidewalk cleaning, 250
Sidewalks, obstruction, 70, 72, 73; width of, 59
Sieges Allee, Berlin, 134
Sitte, Camillo, 3
Skylines, 167, 168
Skyscrapers, 161, 315
Sleeping rooms, 179
Small manufacturer, 226
Snow removal, 248, 251
Social evil, 53
Spree Bridge, Berlin, 101
Sprinkling apparatus, 252
Squares, 122, 126
Stadiums, 147
Stairways, 178
Slaughter-house, Dresden, 228
Steam electric power plants, 271, 274
Stellungen, water works, 275
Storm sewers, 244
Strand bath, artificial, 225
Streets, care of, 67, 245
Street cars, 129, 277
Street cleaning, 248; hours of, 249; department, Berlin, 253; crew, 249
Street construction, 230
Street crossings, underground, 125; superimposed, 128
Street drainage, 247
Streets in Europe, 58
Street flushing, 247
Street foundation, 236
Streets in Hamburg, 69
Street illumination, 75; lighting, 77; names, 120; paving, 231; plan, 42; profiles, Berlin, 56, 57; Prussian law, 58; obstructions, 69; railways, 275; residential, Berlin, 175; sanding, 245; signs, 74, 132; sprinkling, 245; sweeping cans, 248
Streets, up-to-date, 67; width of, 58, 167; widening, 84, 290
Stübben, Joseph, 3
Subway Kiosk, Buda-Pest, 120
Subways, 111, 239
Subway, Paris, 276
Subway station, 312, 316
Sub-surface, draining of streets, 246
Sub-stations for electric distribution, 276
Suburban gardens, 194
Suburban colony, Ahrensfelde, 301
Summer houses, 194
Sunken refuse receptacle, 248
Superimposed street crossing, 128
Streets, replanning, Cologne, 61
Suspended railway, 279
Suspension bridge 101, 104
Swimming pool, St. Louis, 220

Tall buildings, 171
Tauentzien Street, Berlin, 68
Tempelhofer Feld, 296
Terminal approaches, Berlin, 63
Terminal fountain, 265
Terrace, Central Park, New York, 234
Terrace, Sanssouci, 135
Thames Embankment, London, 97
Theater, Gaiety, London, 69
Theater, Municipal, Frankfort, 204
Theaters, location, 204
Tivoli, hydro-electric plant, Rome, 317
Town planning, 295, 300
Trafalgar Square, London, 58
Traffic, congested streets, 124; commission, London, 58; handling, 278; regulations, 122, 130; street signs, 132; system, development of, 276
Transportation, 106
Transportation terminals, 129
Travelers, 31
Trees, shade, 79, 150; as focal points, 152
Trevi Fountain, 265
Trier (Tréves) Porta Nigra, 12
Trolley cars, 106
Trolley post, 72, 153
Tunnel, public utility, 241

Underground comfort stations, 156; traffic, 240; work, Hamburg, 69; street crossings, 125
Union R. R. Station, Washington, 106
Unter den Linden, Berlin, 159
Ulm, plan of Cathedral, 204
Ulm, housing problems, 197

Valuation of public utilities, 281; of water supply system, 283
Vehicular traffic, 106